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Huang et al.

(10) **Patent No.: US 7,937,976 B2**
(45) **Date of Patent: *May 10, 2011**

(54) **REKEYABLE LOCK CYLINDER AND OPERATING METHOD THEREOF**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 85 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **12/432,201**

(22) Filed: **Apr. 29, 2009**

(65) **Prior Publication Data**

US 2009/0277233 A1 Nov. 12, 2009

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/149,757, filed on May 7, 2008, now Pat. No. 7,624,606.

(51) **Int. Cl.**
E05B 27/04 (2006.01)
E05B 29/06 (2006.01)

(52) **U.S. Cl.** **70/338**; 70/340; 70/368; 70/383; 70/384; 70/492; 70/493; 70/495

(58) **Field of Classification Search** 70/337–343, 70/368, 382–385, 492–496
See application file for complete search history.

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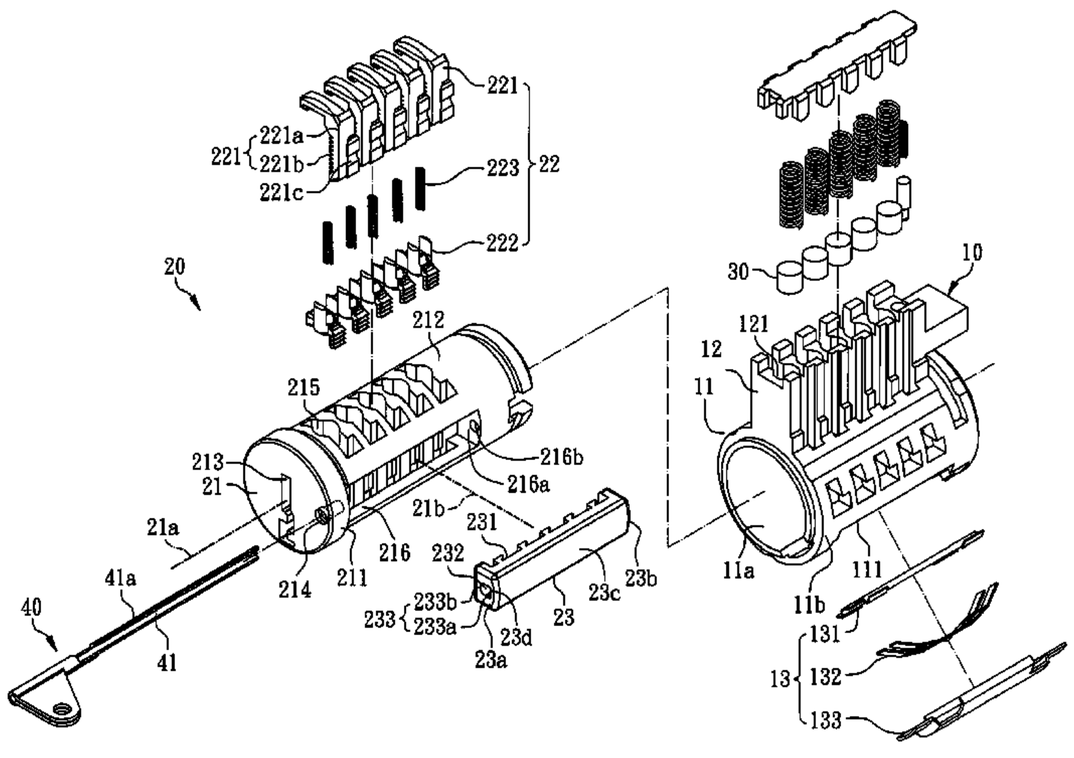
(74) *Attorney, Agent, or Firm* — Muncy, Geissler, Olds & Lowe, PLLC

(57) **ABSTRACT**

A rekeyable lock cylinder comprises a cylinder body and a plug assembly disposed within the cylinder body. The plug assembly comprises a plug body, a plurality of assembled pins and a position block. The plug body has a longitudinal axis, a transverse axis vertical to the longitudinal axis, a keyhole and a first through hole. Each of the assembled pins is movably disposed in the plug body and comprises a first rack component and a second rack component selectively engaging with the first rack component. The position block disposed at the plug body has a plurality of pin runners used for disposing the first rack components, a second through hole corresponding to the first through hole and a tool-contacting surface located within the second through hole. The position block can move along the transverse axis-direction of the plug body to make each of the first rack components reengage with each of the second rack components.

17 Claims, 15 Drawing Sheets



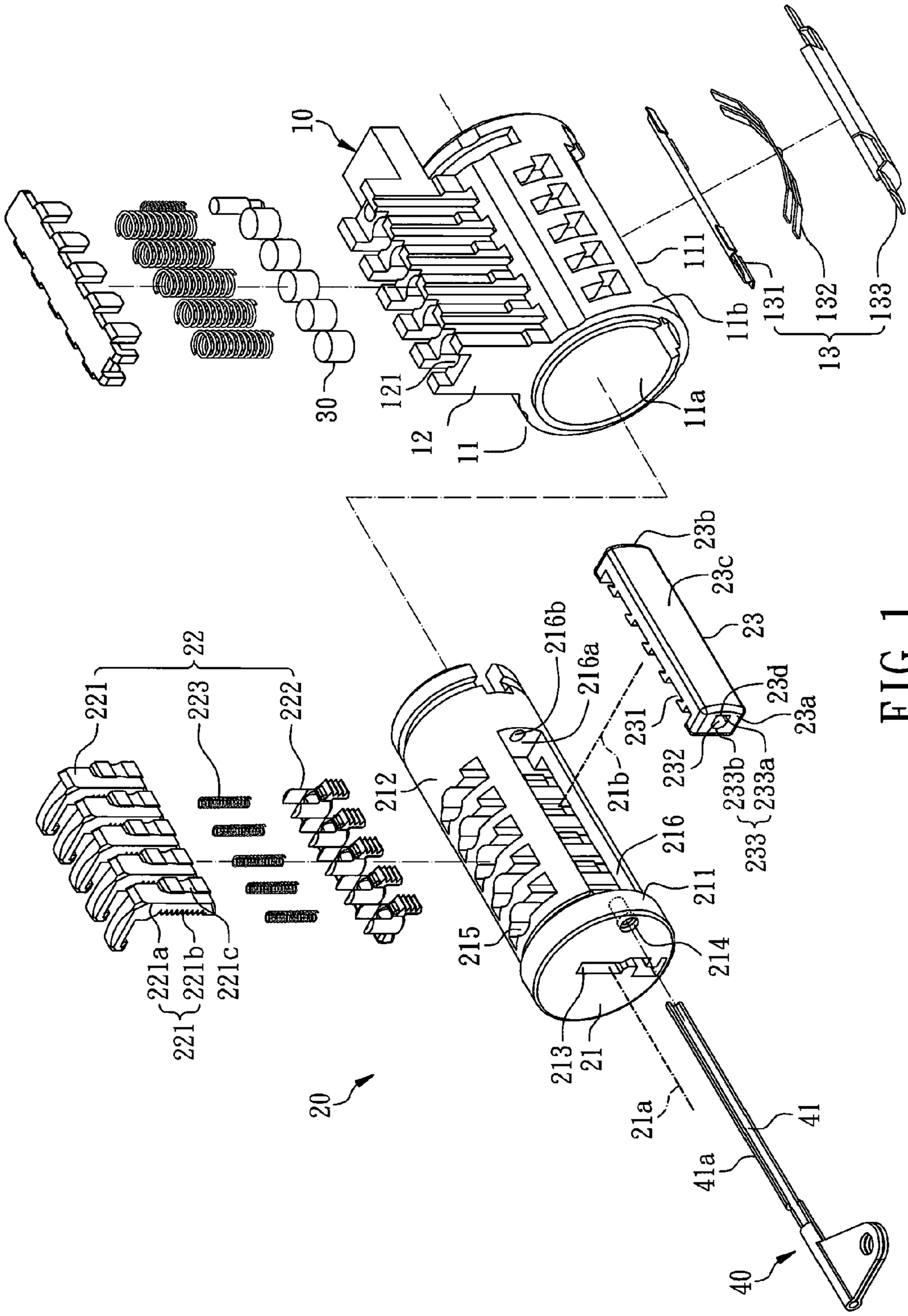

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FIG. 1

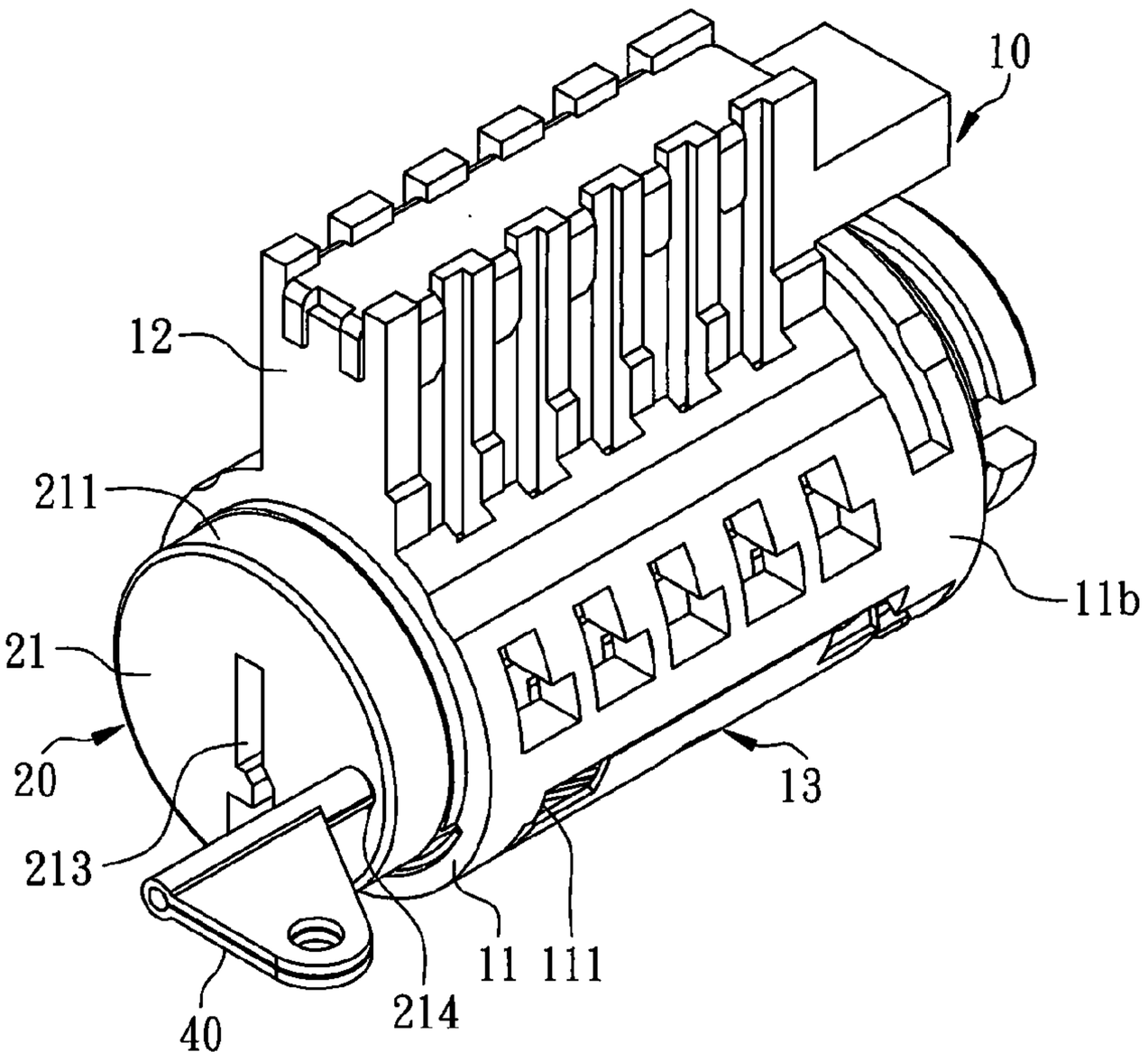
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FIG. 2

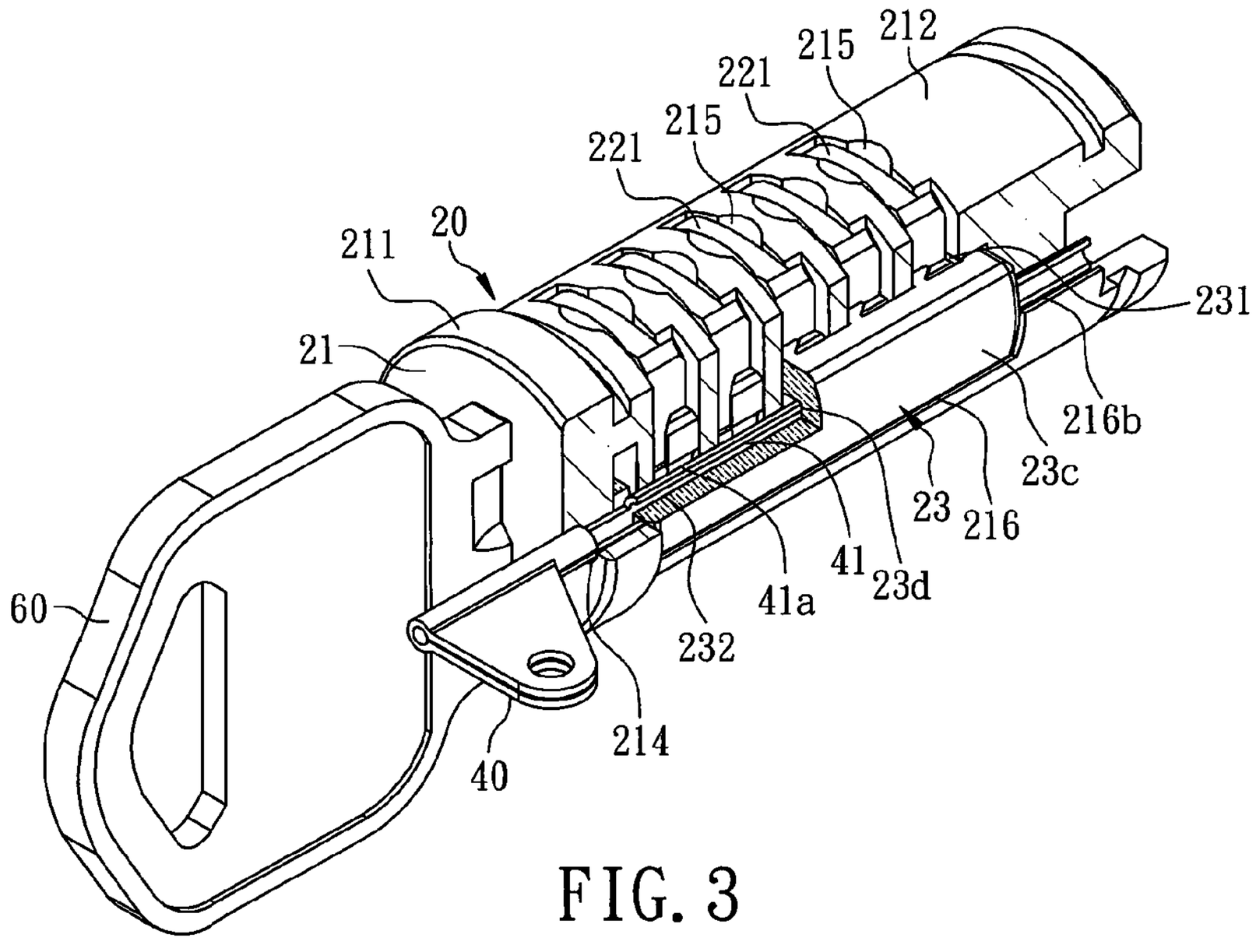
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FIG. 3

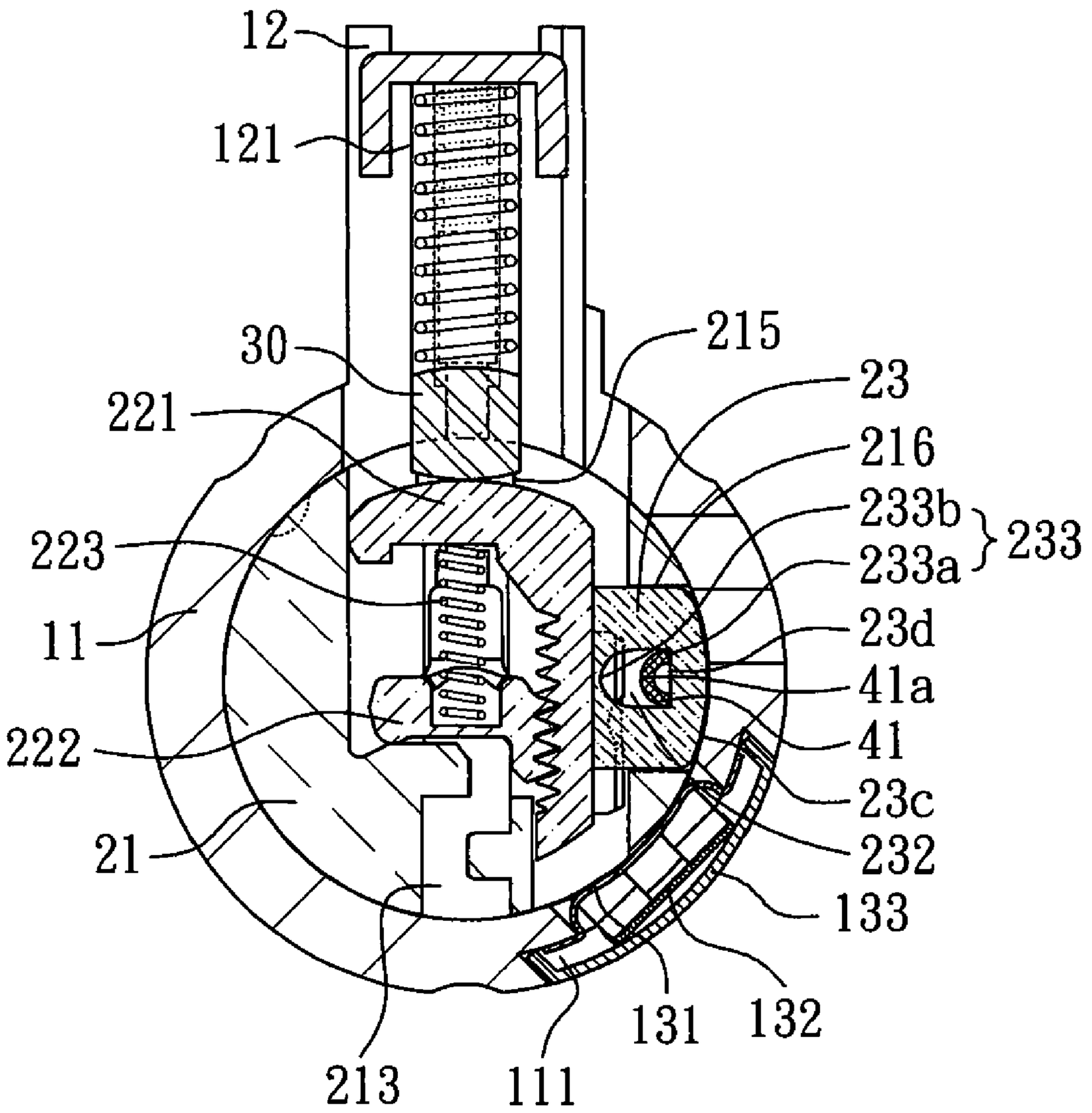
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FIG. 4

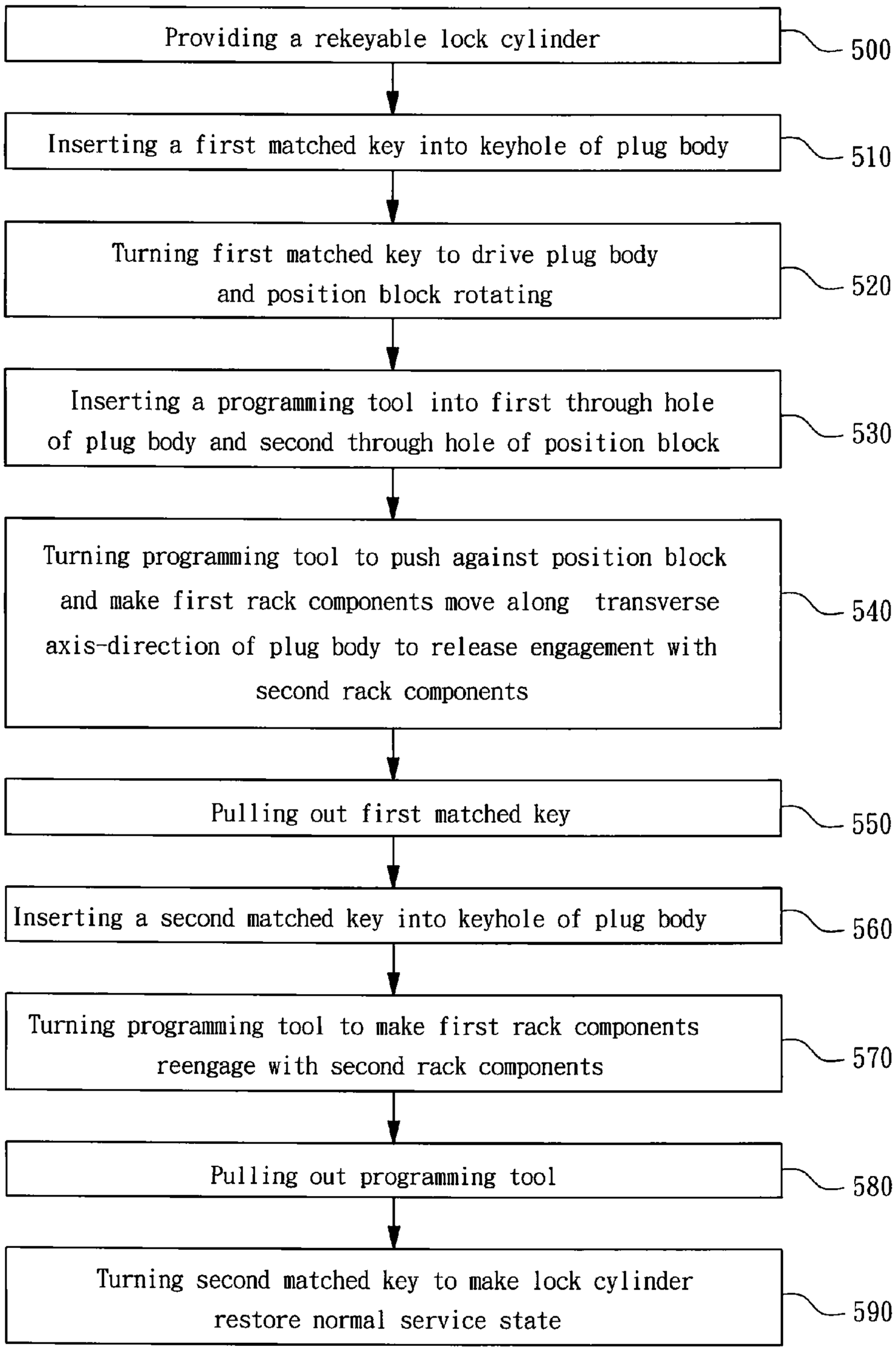
Providing a rekeyable lock cylinder
500
Inserting a first matched key into keyhole of plug body
510
Turning first matched key to drive plug body and position block rotating
520
Inserting a programming tool into first through hole of plug body and second through hole of position block
530
Turning programming tool to push against position block and make first rack components move along transverse axis-direction of plug body to release engagement with second rack components
540
Pulling out first matched key
550
Inserting a second matched key into keyhole of plug body
560
Turning programming tool to make first rack components reengage with second rack components
570
Pulling out programming tool
580
Turning second matched key to make lock cylinder restore normal service state
590

FIG. 5

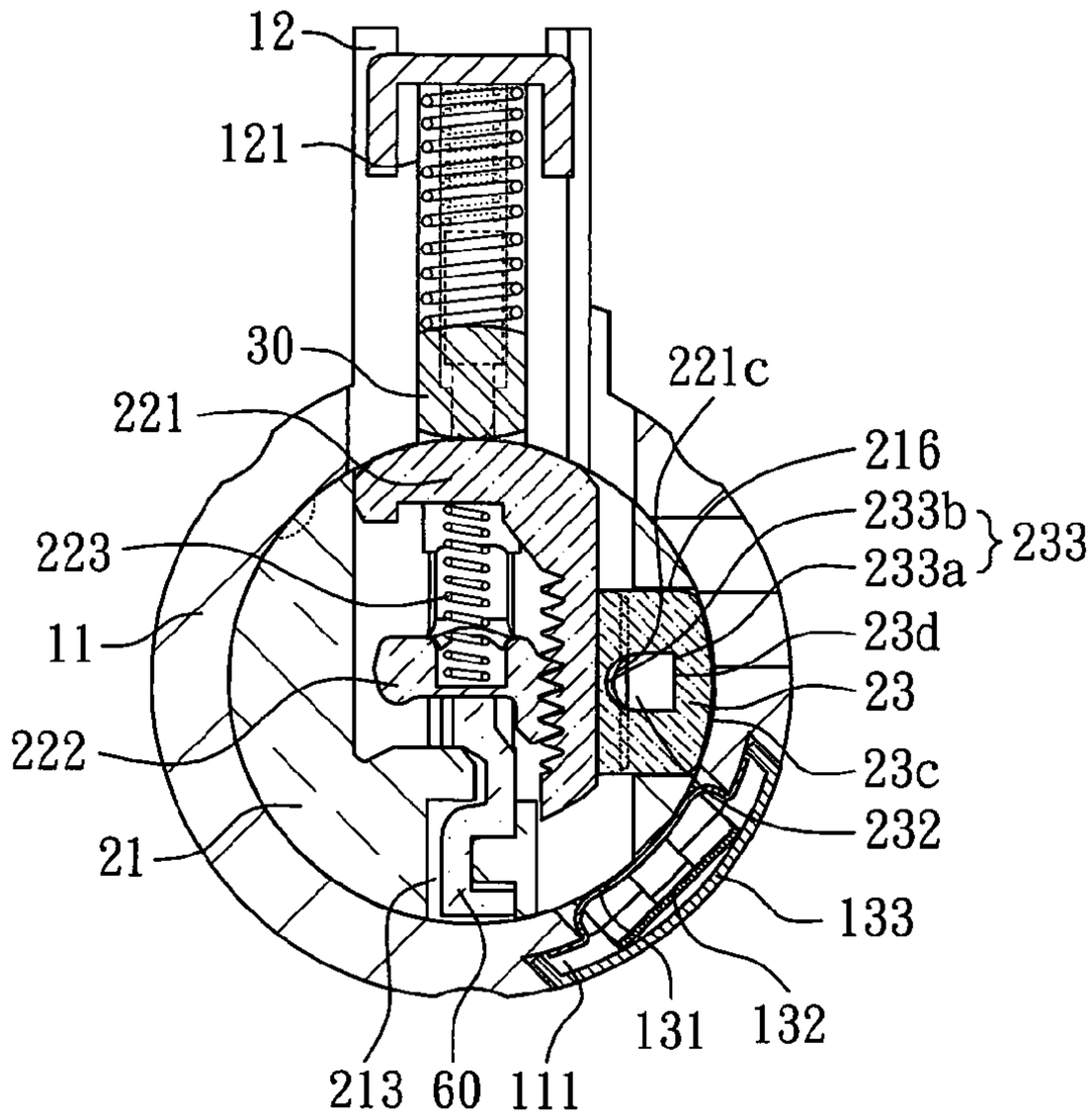
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FIG. 6

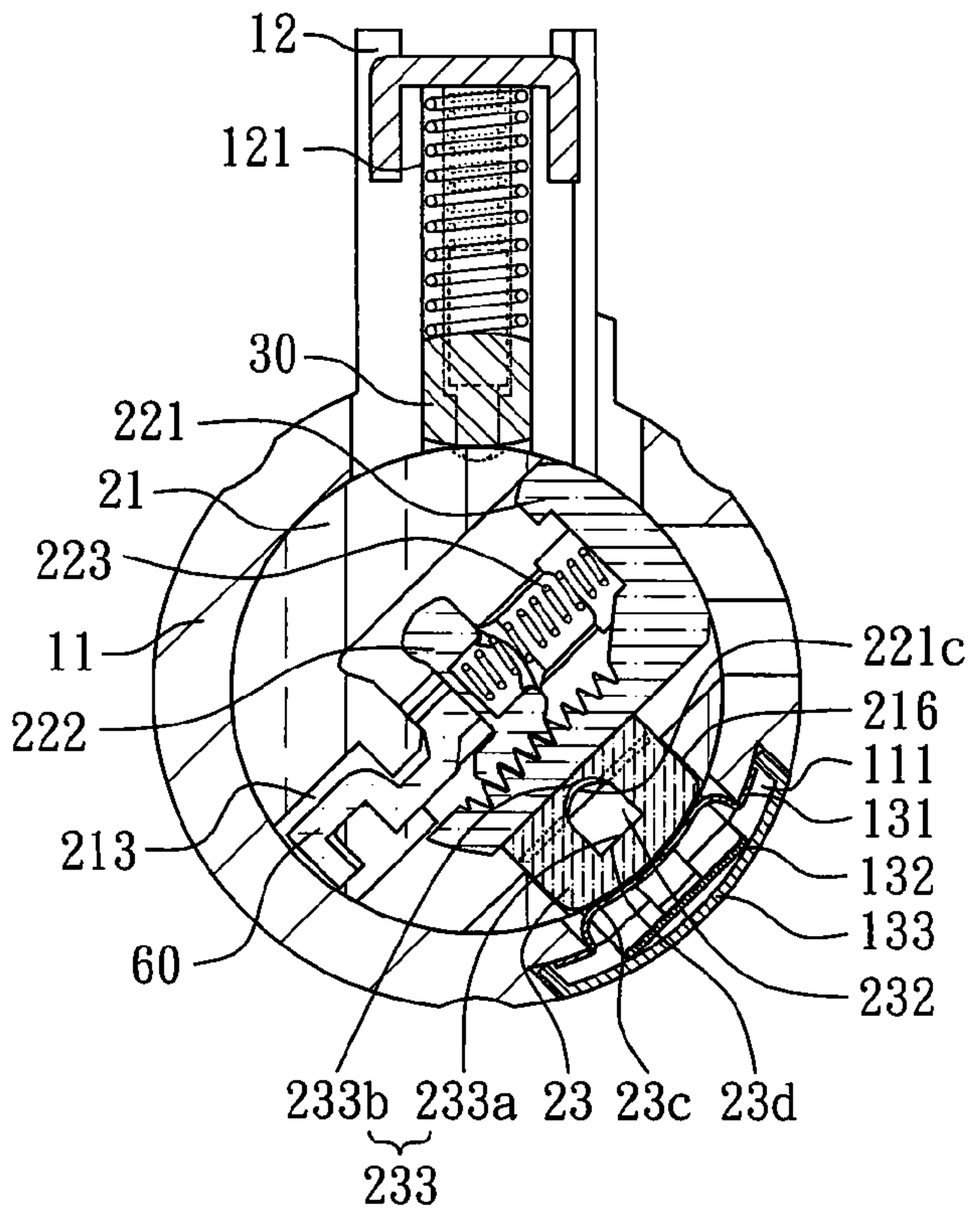
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FIG. 7

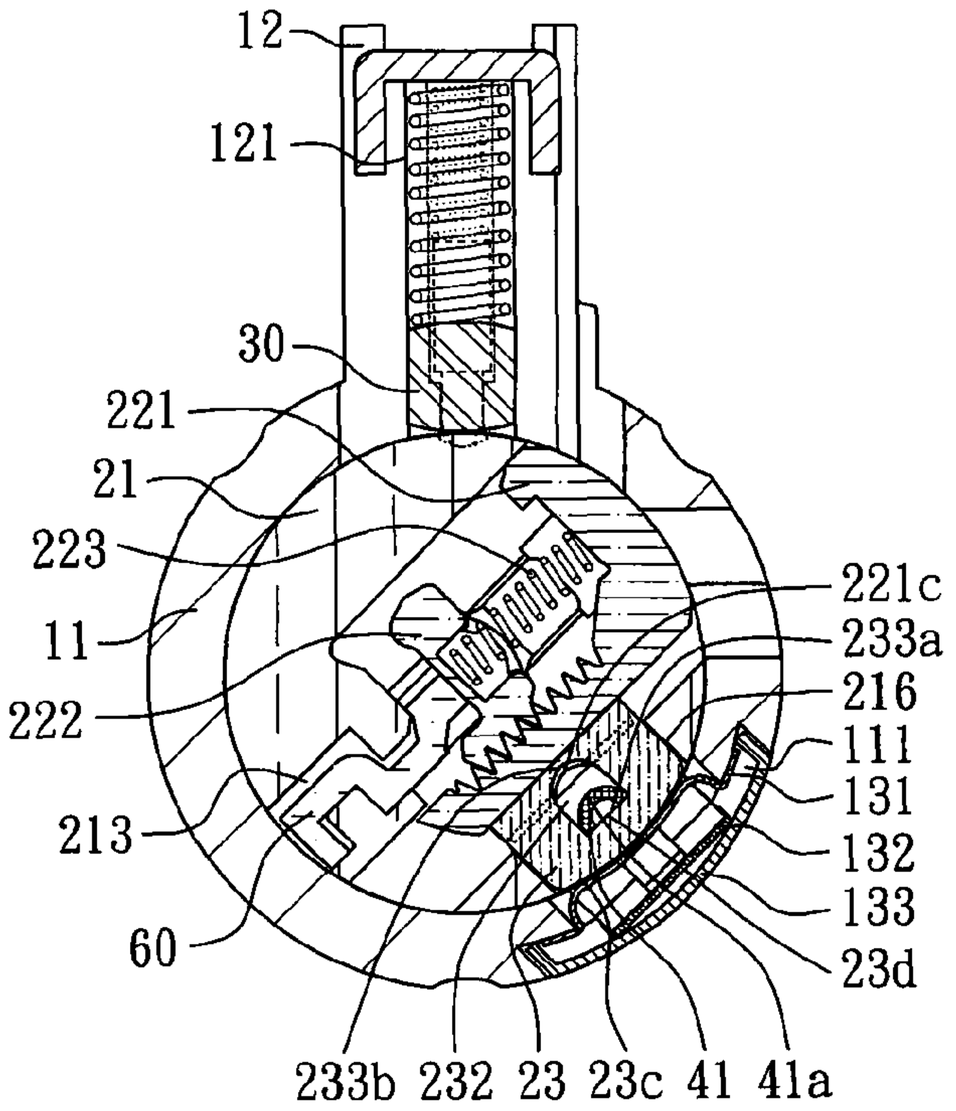
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FIG. 8

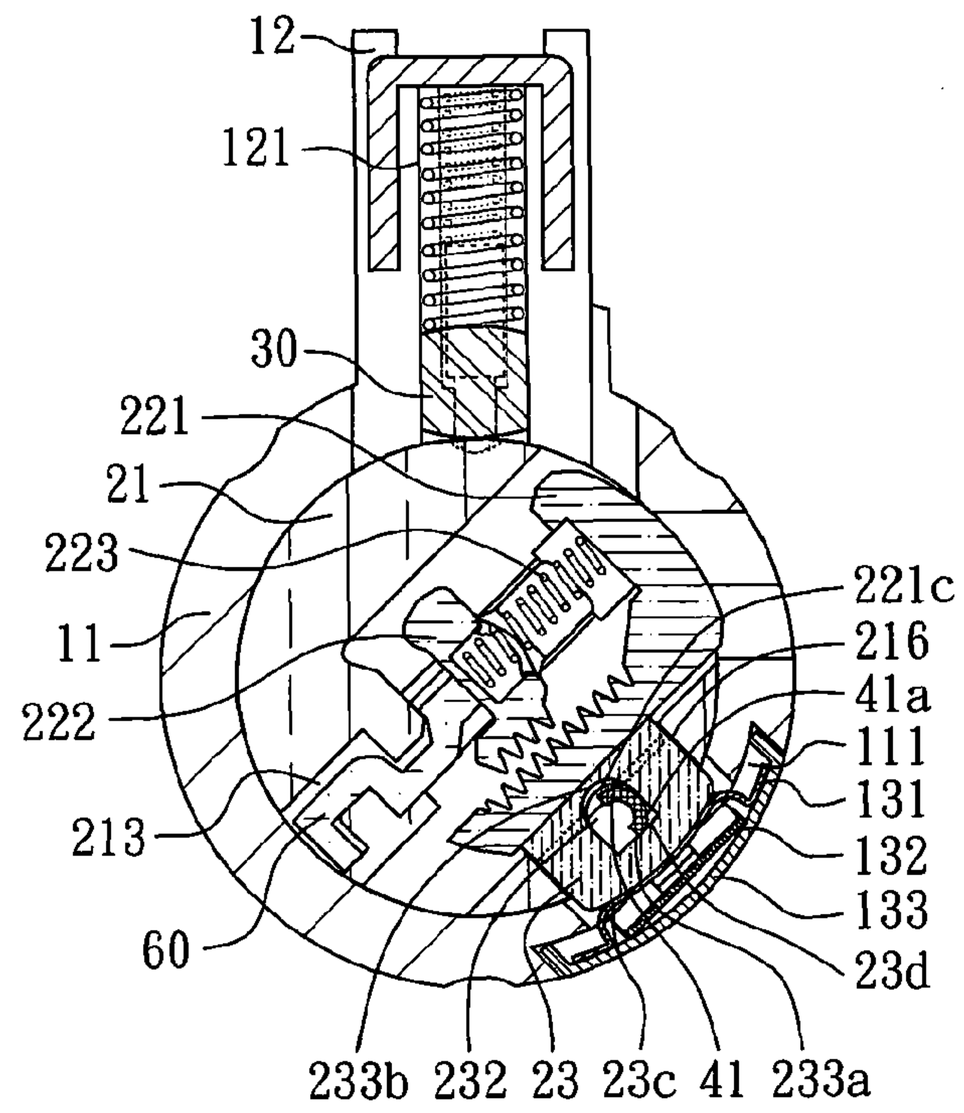
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FIG. 9

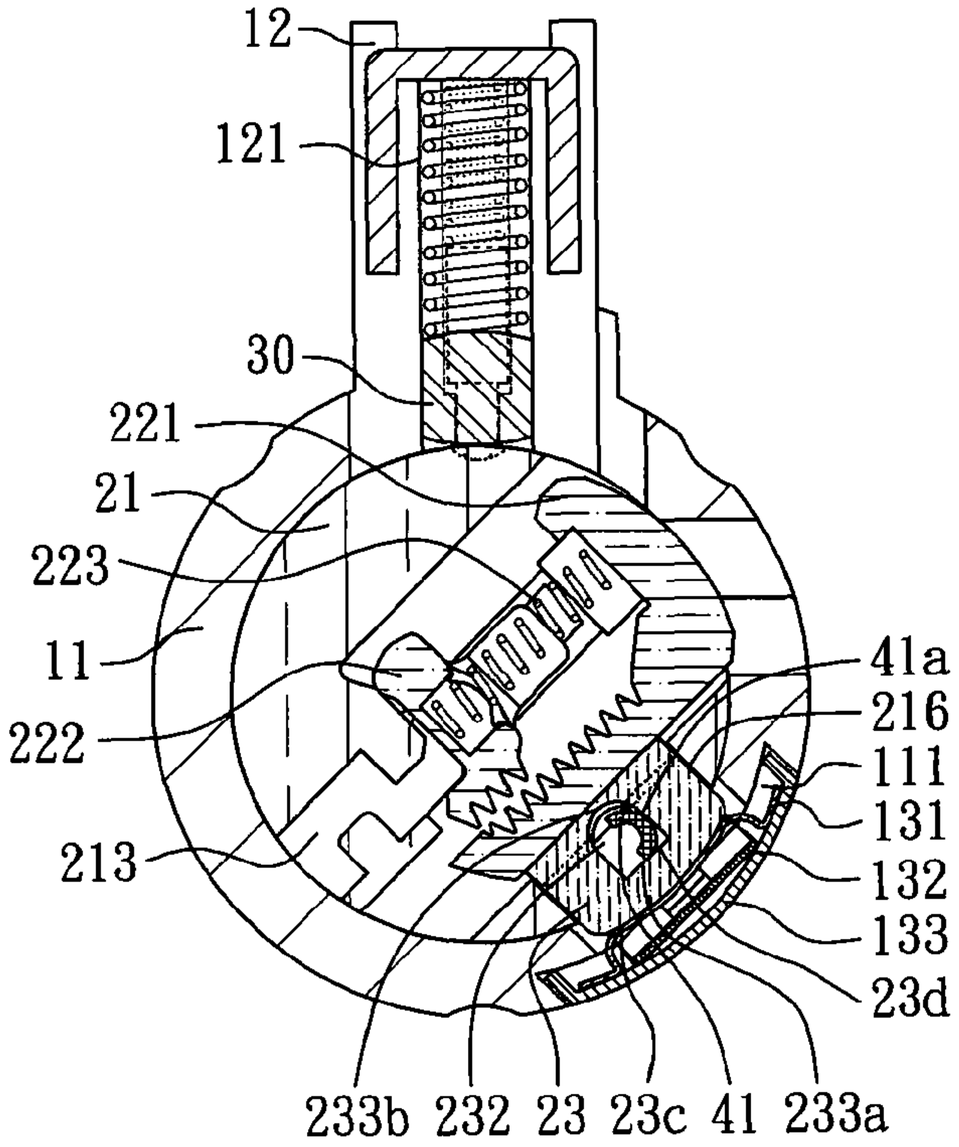
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FIG. 10

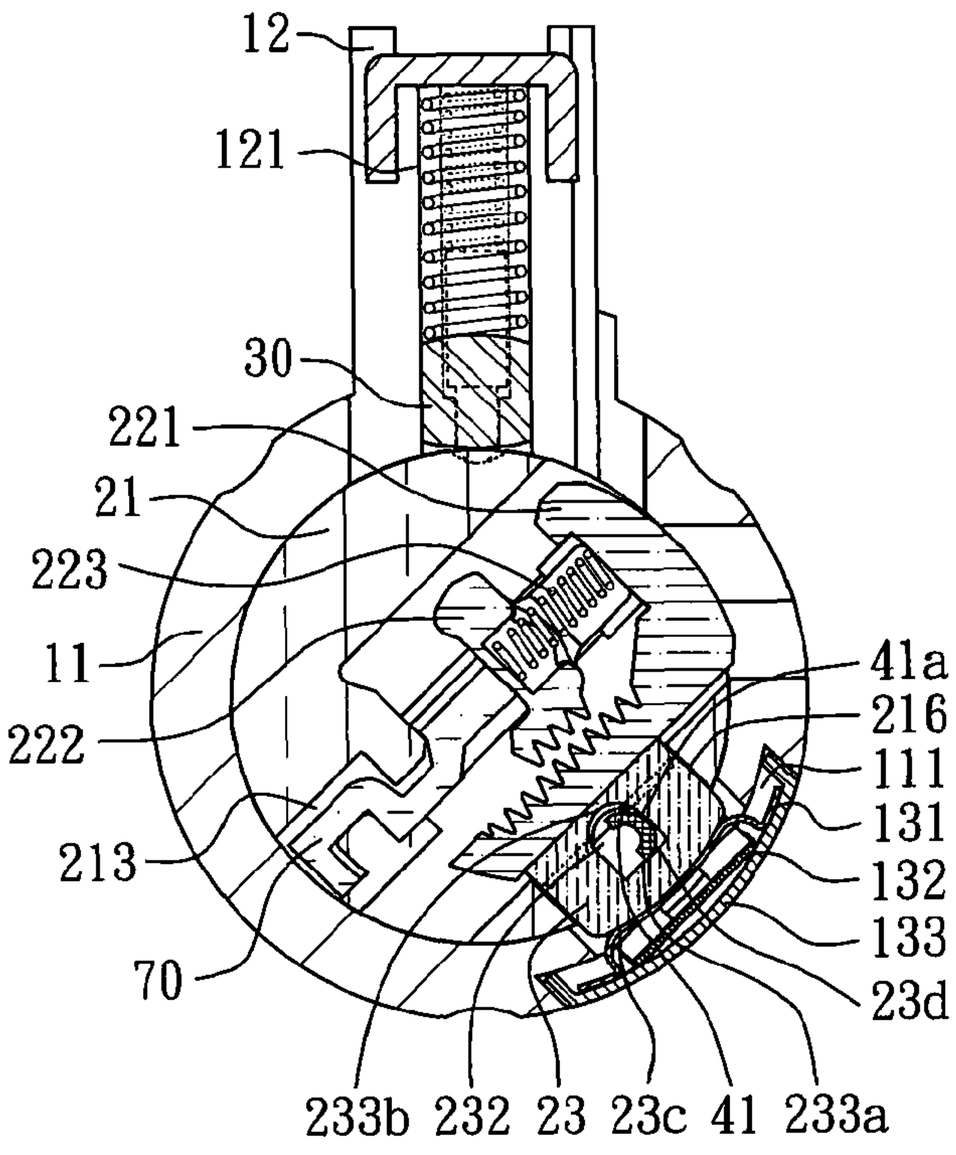
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FIG. 11

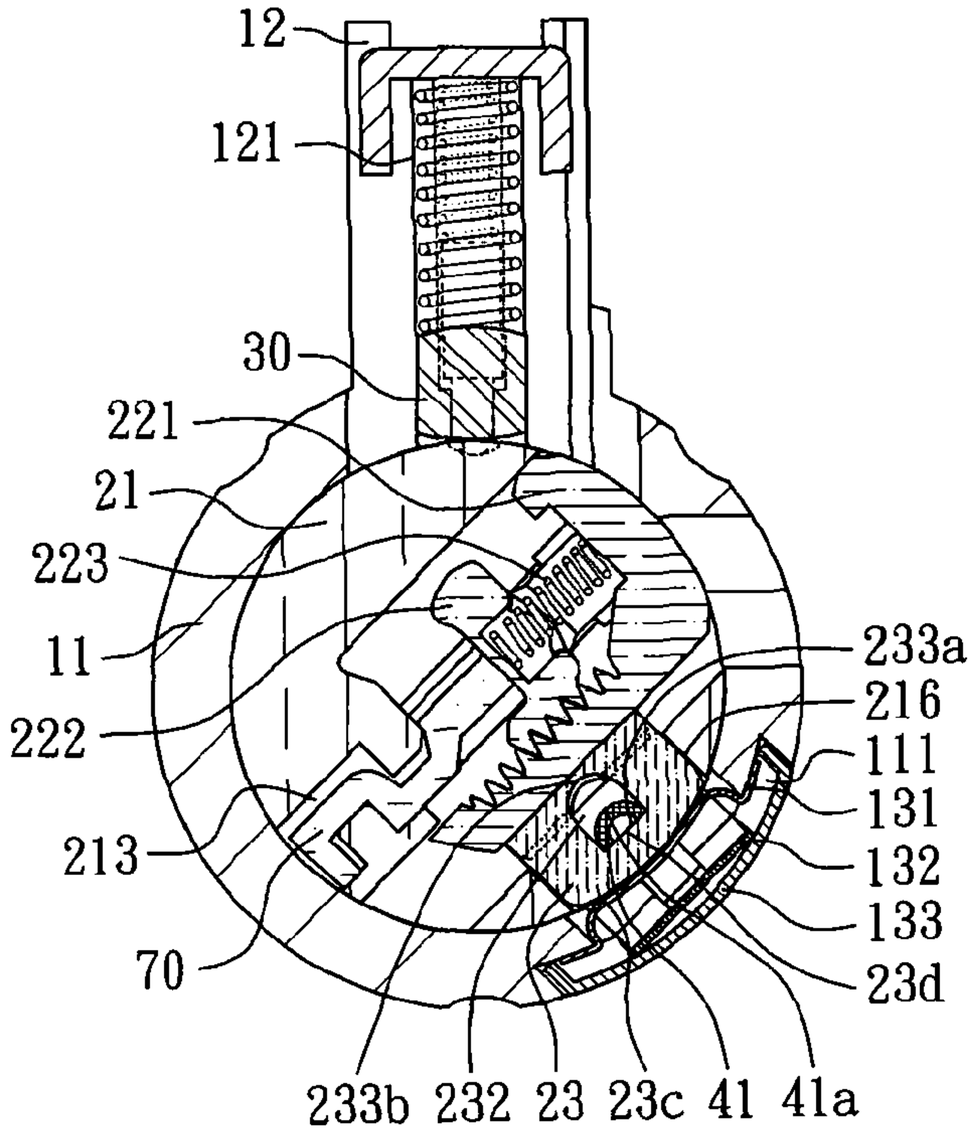
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FIG. 12

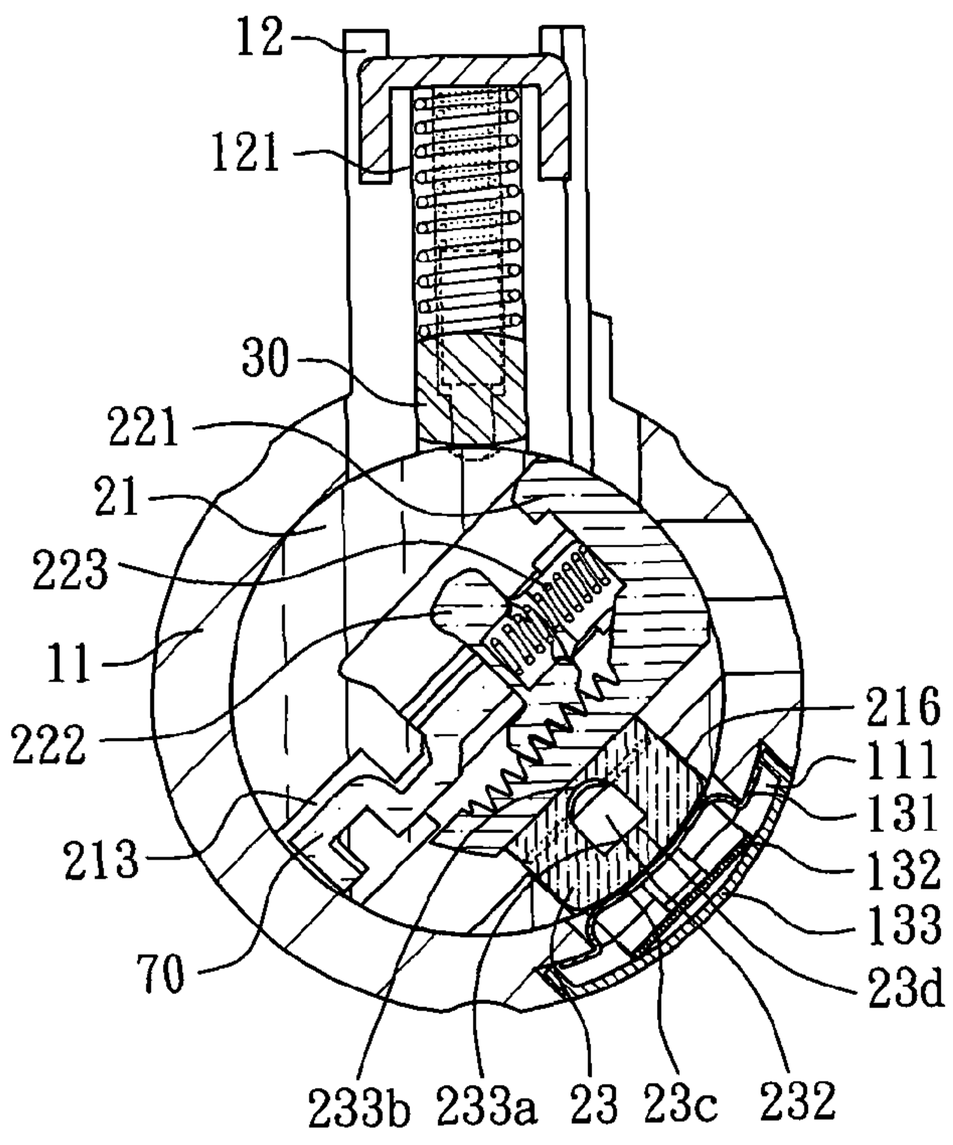
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FIG. 13

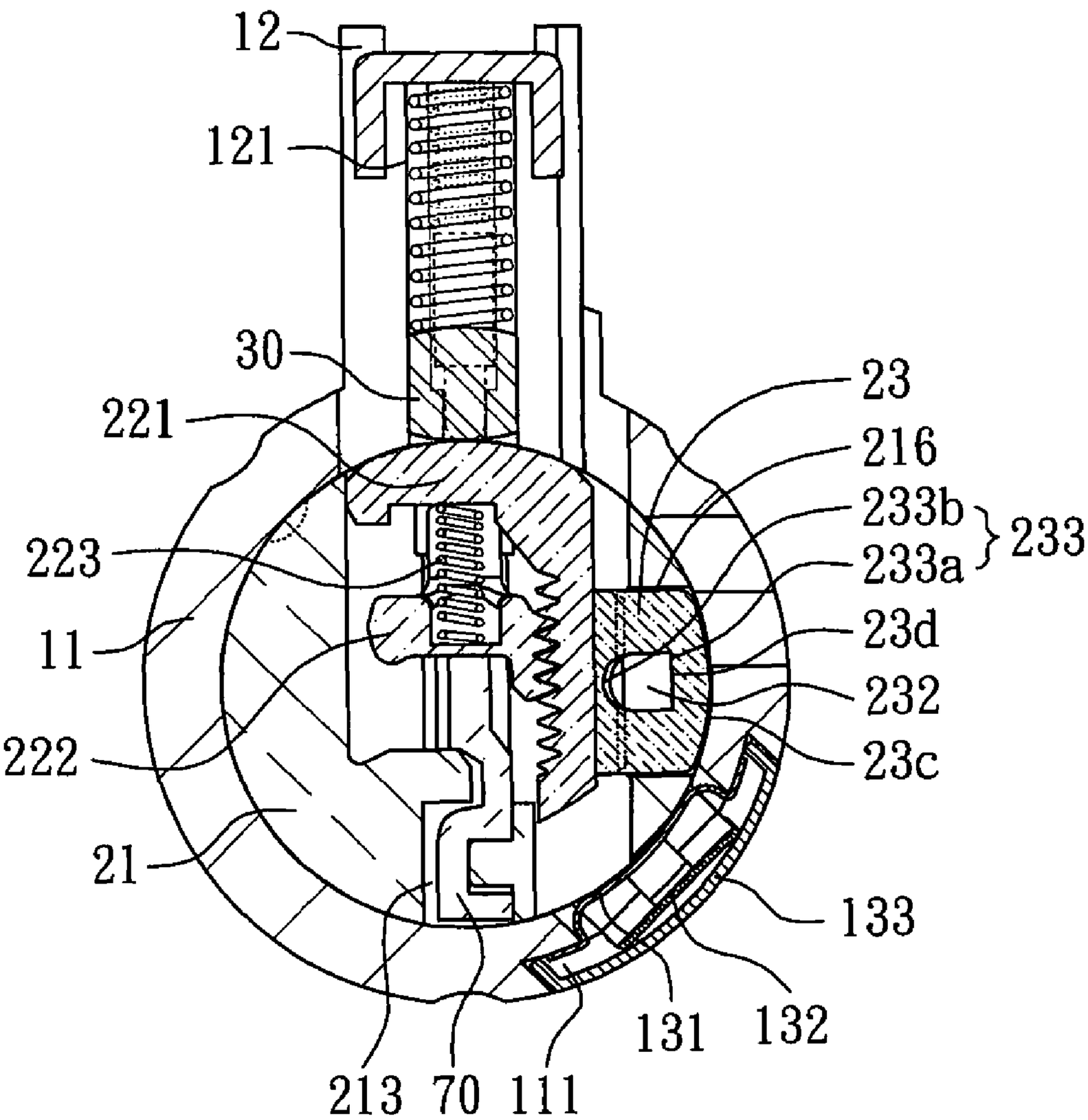
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FIG. 14

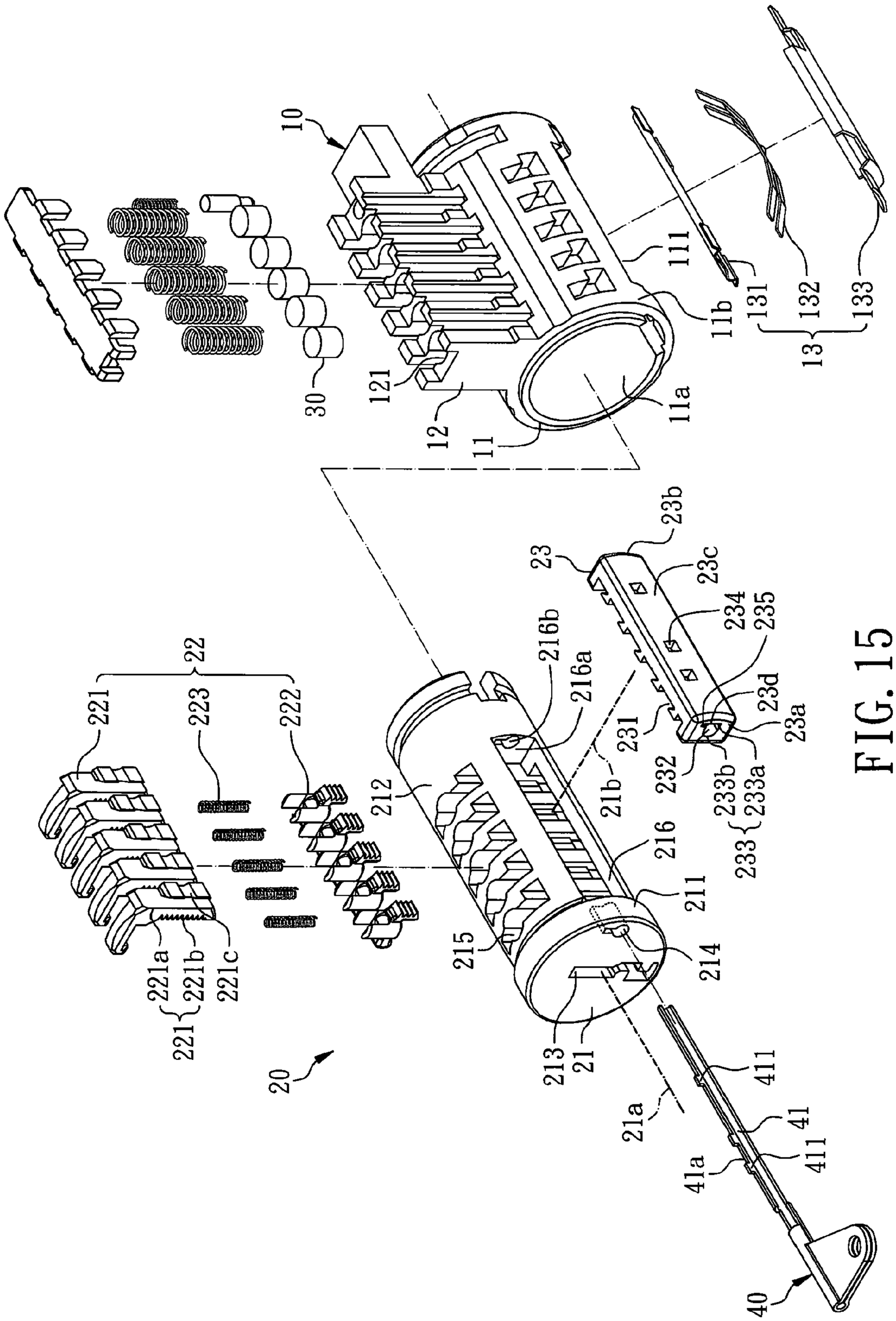
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FIG. 15

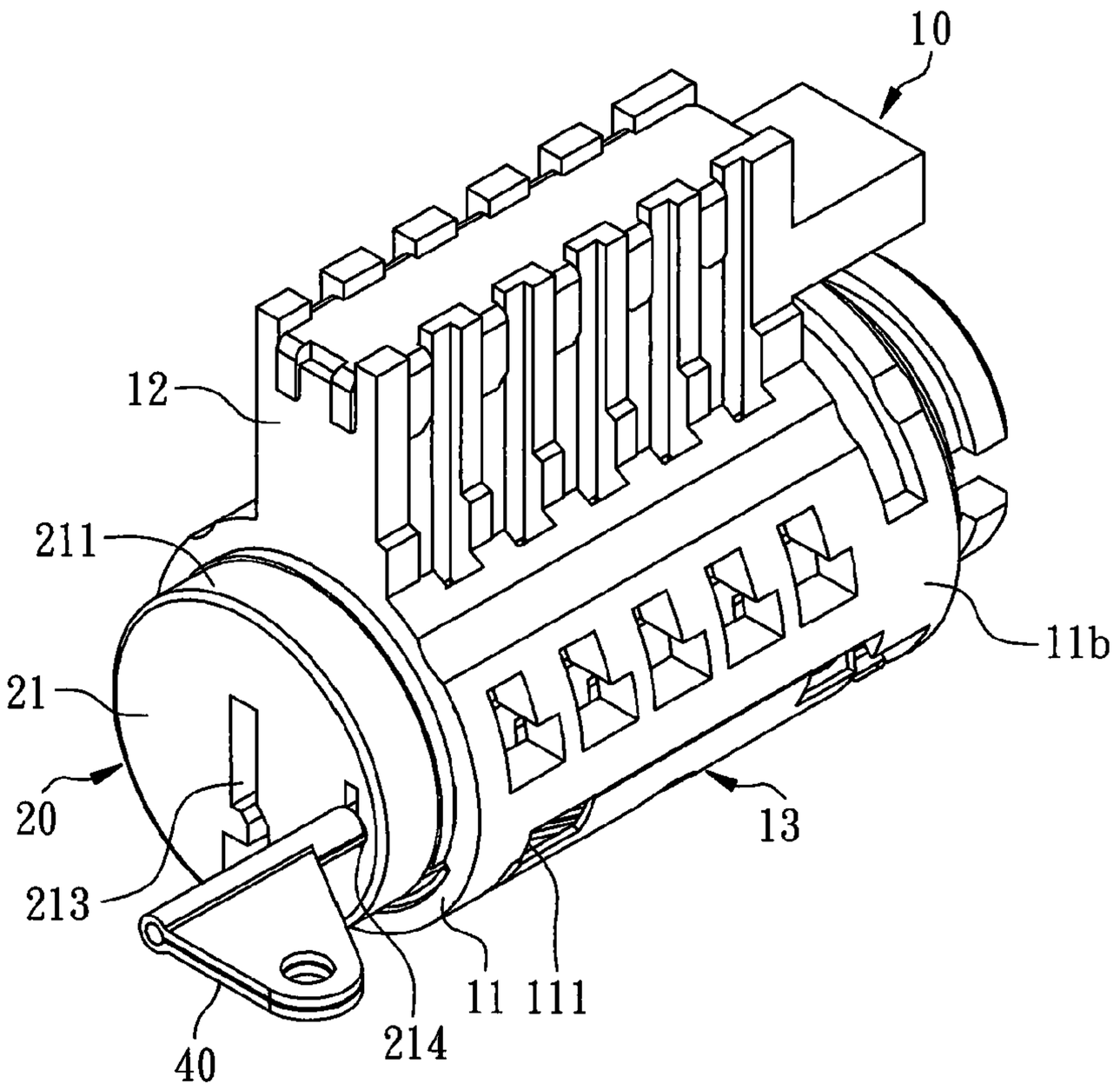
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FIG. 16

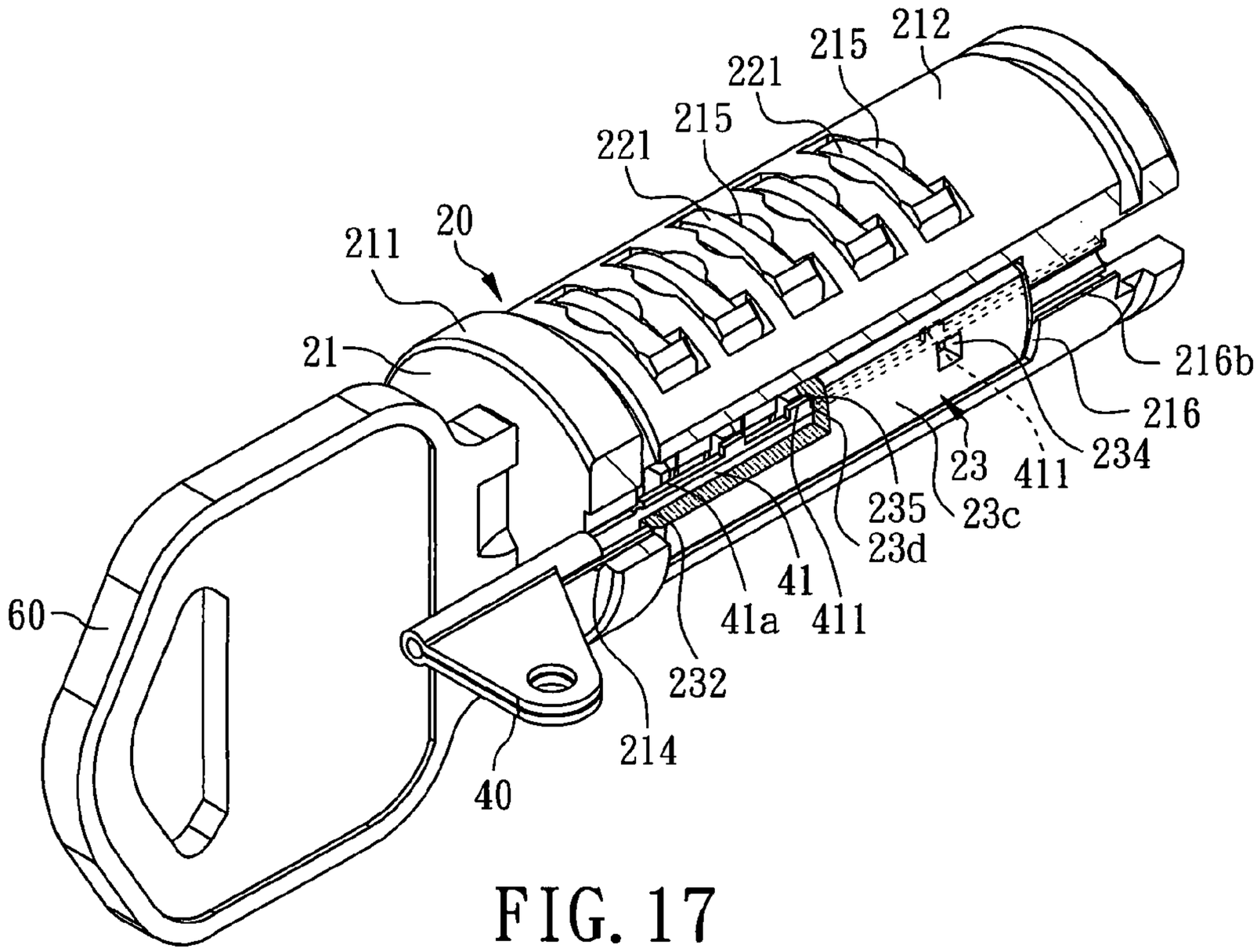
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FIG. 17

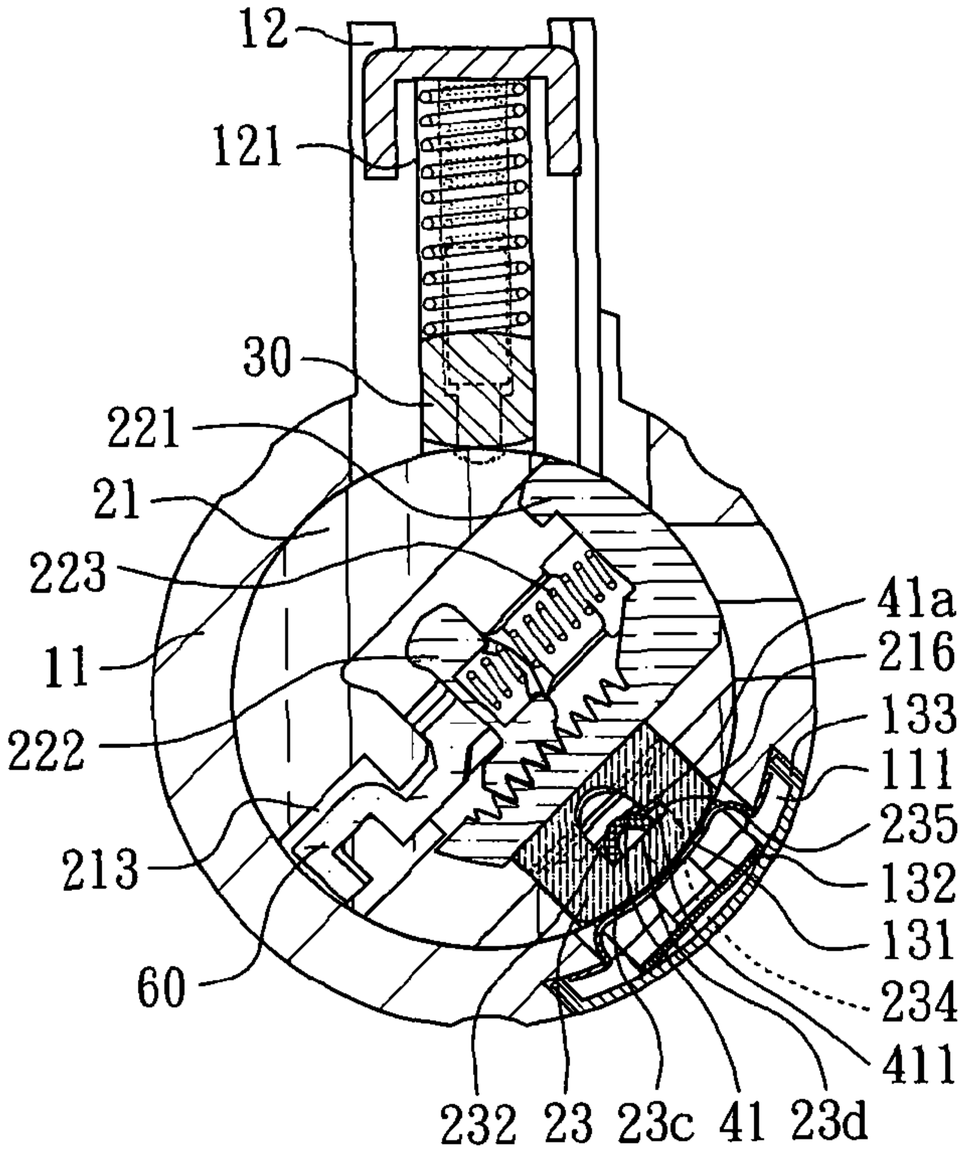
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FIG. 18

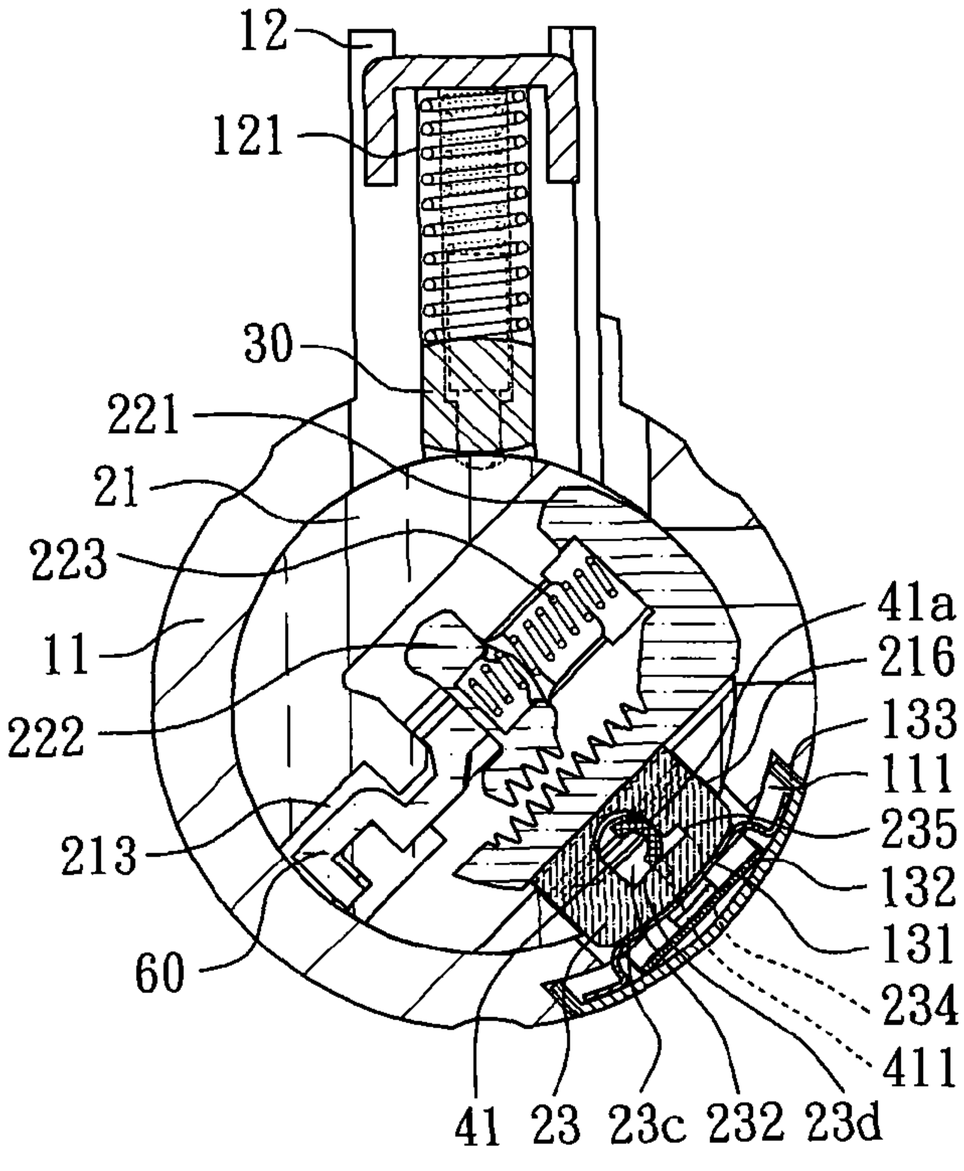
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FIG. 19

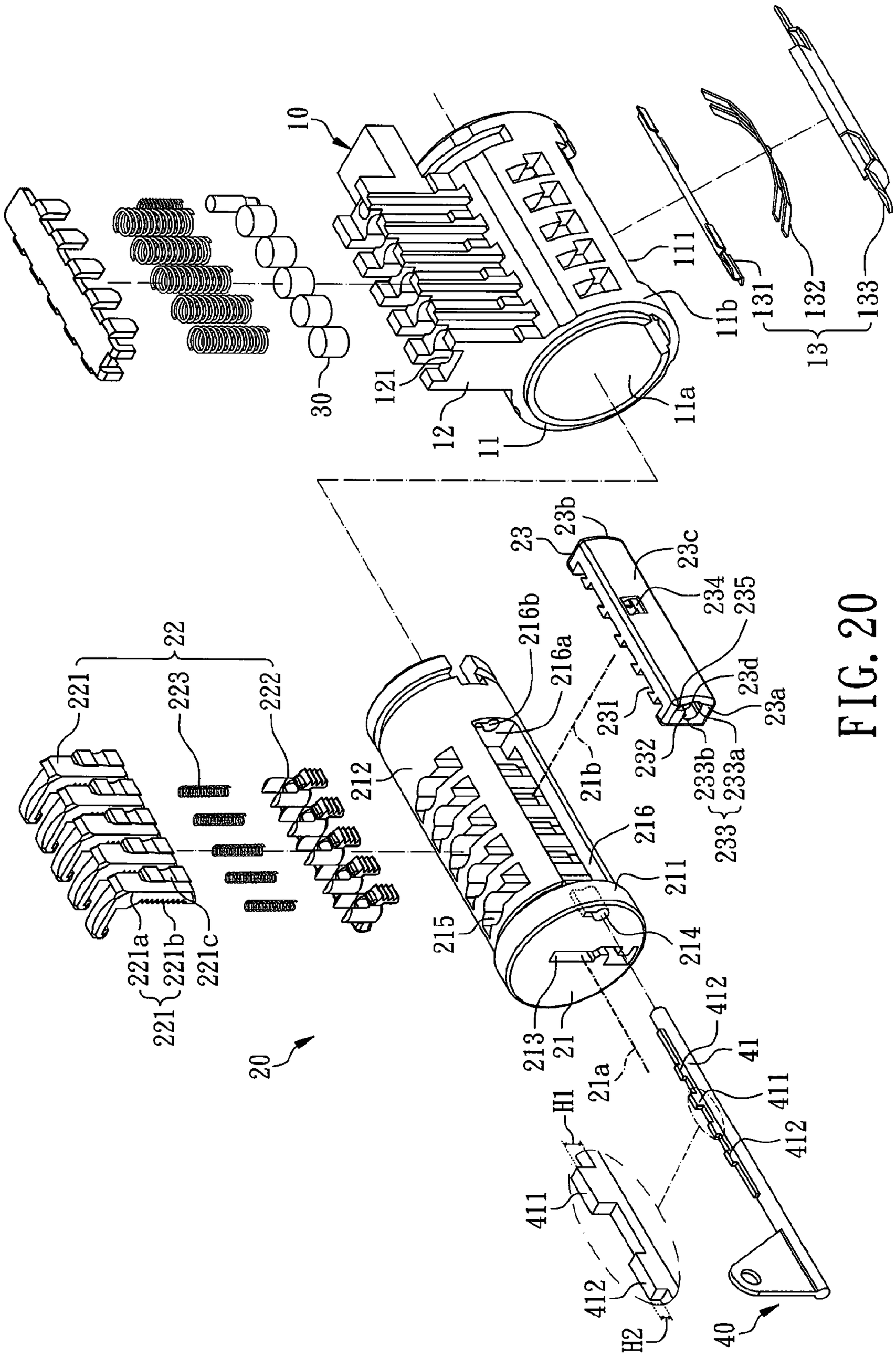
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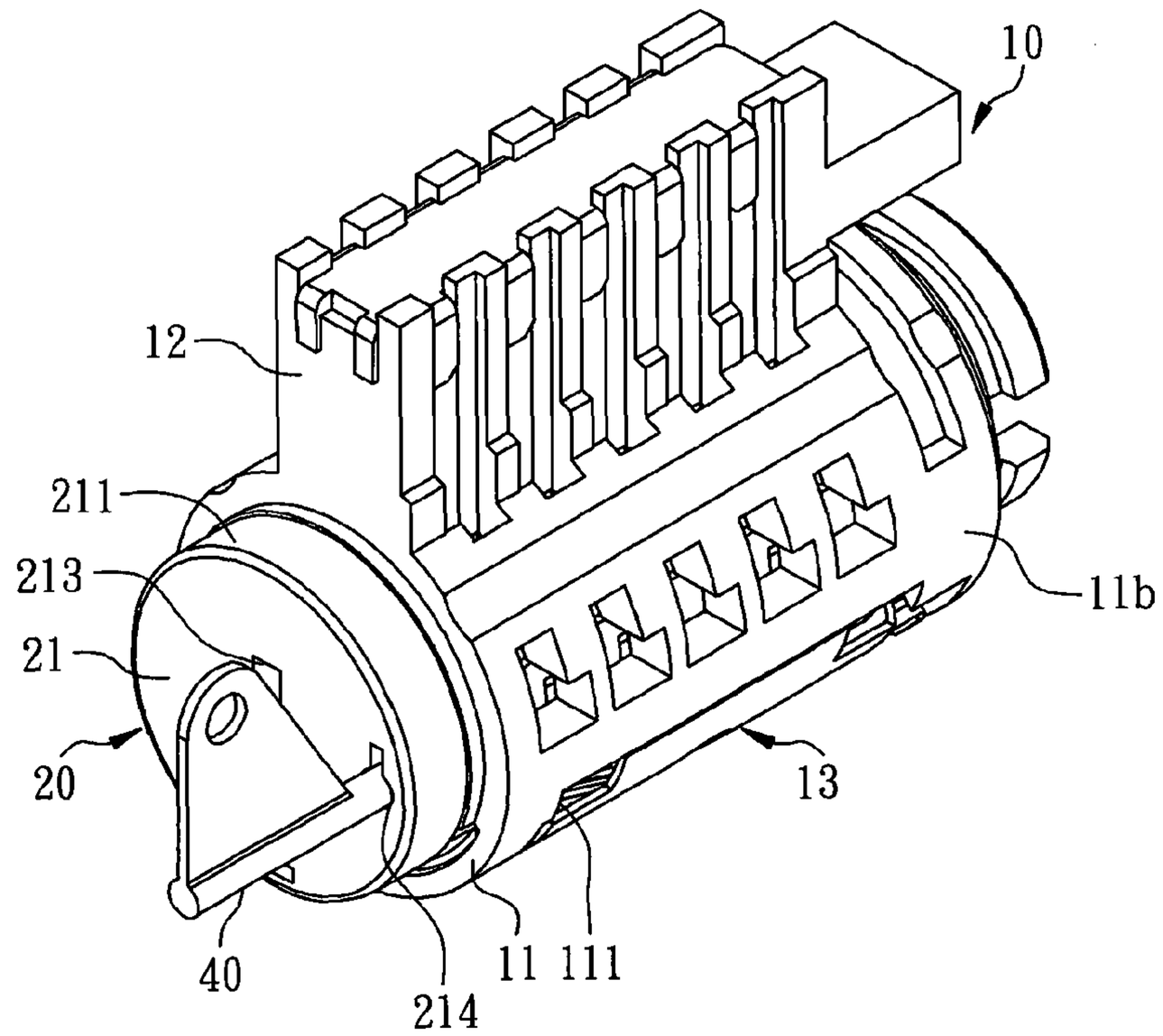
FIG. 20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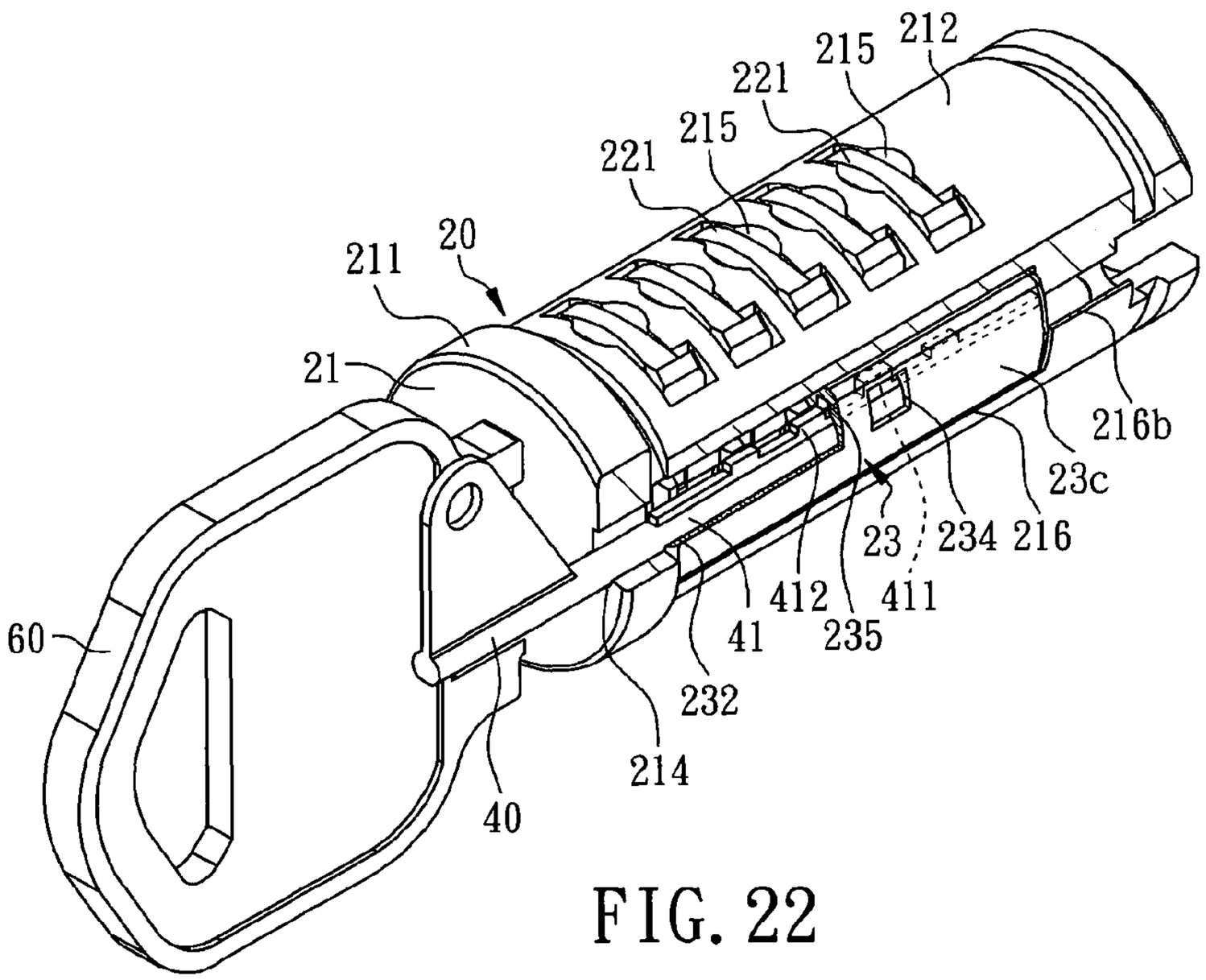
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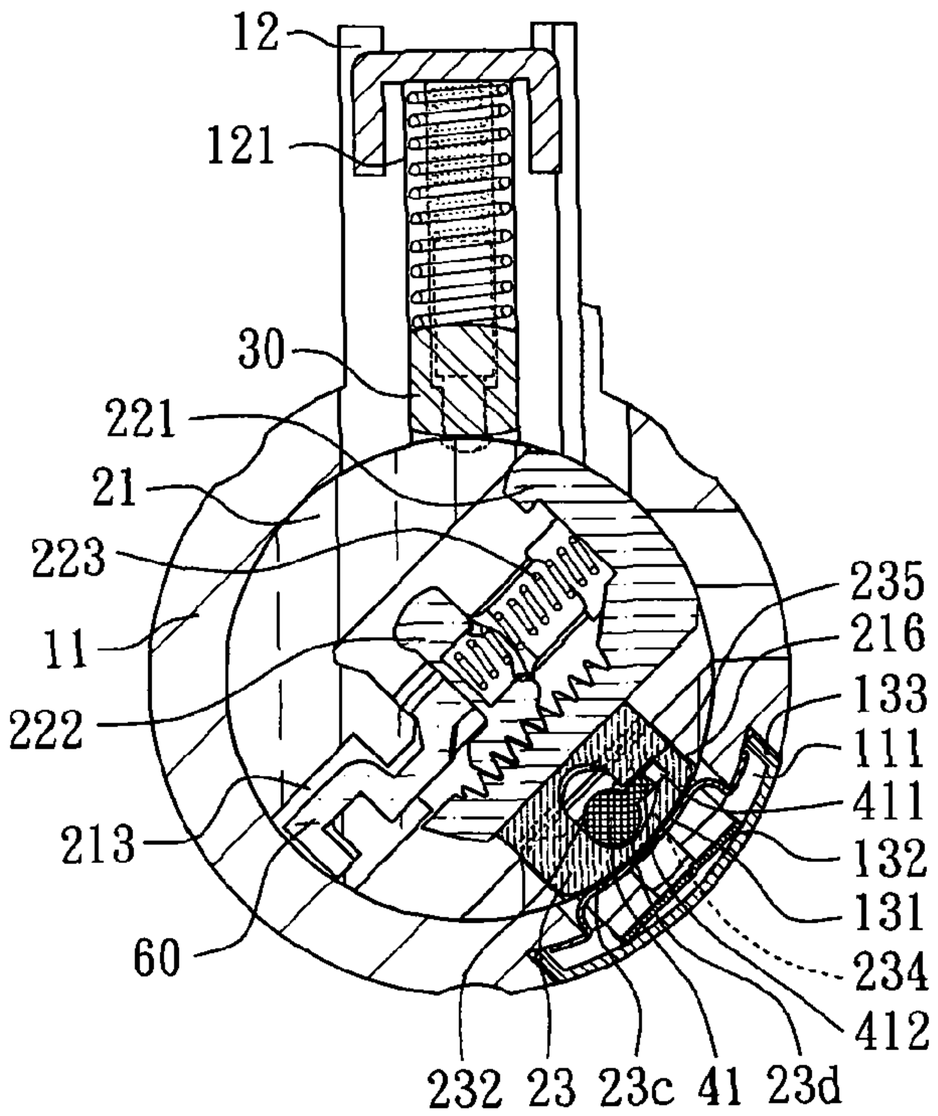
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FIG. 23

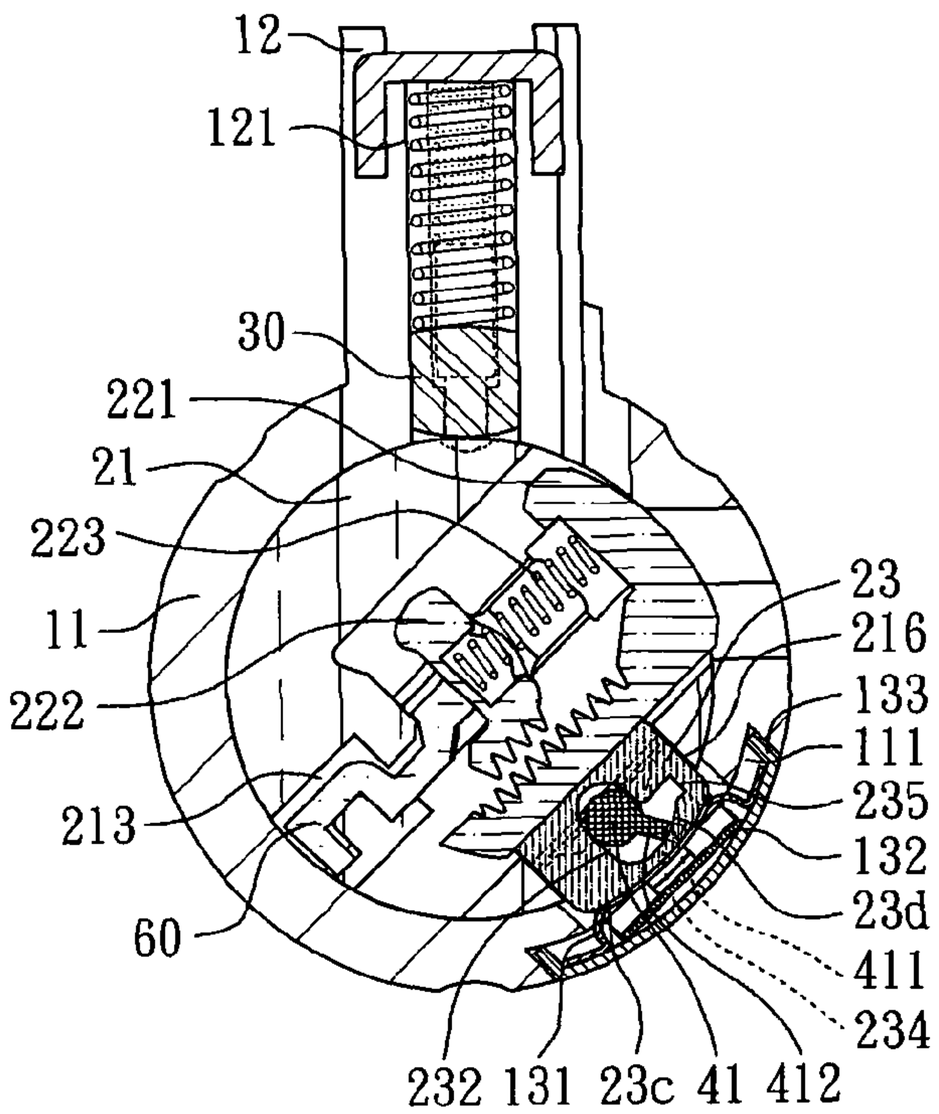
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FIG. 24

REKEYABLE LOCK CYLINDER AND OPERATING METHOD THEREOF

This application is a Continuation-in-Part of application Ser. No. 12/149,757, filed on 7 May 2008, now U.S. Pat. No. 7,624,606 and for which priority is claimed under 35 U.S.C. §120; the entire contents of which are hereby incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to a lock cylinder, more particularly to a rekeyable lock cylinder and operating method thereof with reinforced burglarproof.

BACKGROUND OF THE INVENTION

It is almost required to release mutual engagement of racks at first during rekeying process of known rekeyable lock cylinder and reengage racks after rekeying, such as U.S. Pat. No. 6,860,131 "rekeying a lock assembly" discloses a simple tool used for pushing linkage mechanism within a lock to rekey. However, linkage mechanism of the foregoing lock cylinder lacks burglarproof in design when rekeying as well as the simple tool is easy to obtain, that might be subject to unauthorized rekeying operation resulting in security problem.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a rekeyable lock cylinder and operating method thereof. First, a first matched key is inserted into a keyhole of a plug body and turning the first matched key to drive the plug body and a position block rotating. Next, a programming tool is inserted into a first through hole of the plug body and a second through hole of the position block. Next, the programming tool is turned to push against a tool-contacting surface of the position block and make each of the first rack components move along the transverse axis-direction of the plug body to release engagement with each of the second rack components. Next, the first matched key is pulled out before inserting a second matched key into the keyhole. Finally, the programming tool is turned to reengage the first and second rack components thereby completing overall rekeying process. According to the present invention, the programming tool can contact against the tool-contacting surface of the position block during turning process to push against the position block and drive the first rack components releasing engagement with the second rack components. On the contrary, if the used tool cannot contact against the tool-contacting surface during turning process, the position block cannot be moved to rekey, therefore, the present invent has efficiency of enhancing burglarproof of the rekeyable lock cylinder.

A rekeyable lock cylinder according to the present invention comprises a cylinder body and a plug assembly, and the plug assembly comprises a plug body, a plurality of assembled pins and a position block. The plug body has a longitudinal axis, a transverse axis vertical to the longitudinal axis, a keyhole and a first through hole. Each of the assembled pins is movably disposed in the plug body comprising a first rack component and a second rack component selectively engaging with the first rack component. The position block is disposed at the plug body having a plurality of pin runners used for disposing the first rack components, a second through hole corresponding to the first through hole and a tool-contacting surface located within the second through hole. The position block can move along the transverse axis-direction of the plug body to release engagement of the first and second rack components.

Operating method of a rekeyable lock cylinder according to the present invention comprising several steps will be described as follows. Step 1 is to provide a rekeyable lock cylinder, which at least comprises a plug body, a position block disposed at the plug body and a plurality of assembled pins, wherein the plug body has a transverse axis, a keyhole and a first through hole, each of the assembled pins at least comprises a first rack component and a second rack component in engagement with the first rack component, the position block has a second through hole corresponding to the first through hole and a tool-contacting surface located within the second through hole. Step 2 is to insert a first matched key into the keyhole of the plug body. Step 3 is to turn the first matched key to drive the plug body and the position block rotating. Step 4 is to insert a programming tool into the first through hole of the plug body and the second through hole of the position block. Step 5 is to turn the programming tool to push against the tool-contacting surface of the position block and make each of the first rack components move along the transverse axis-direction of the plug body to release engagement with each of the second rack components. Step 6 is to pull out the first matched key. Step 7 is to insert a second matched key into the keyhole of the plug body. Step 8 is to turn the programming tool to make each of first rack components reengage with each of the second rack components.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective exploded view of a rekeyable lock cylinder according to the first preferred embodiment of the present invention.

FIG. **2** is a perspective assembly view of the rekeyable lock cylinder.

FIG. **3** is a partially broken away side view of a plug assembly according to the first preferred embodiment of the present invention.

FIG. **4** is a longitudinal sectional assembly view of the rekeyable lock cylinder.

FIG. **5** is an operating flow chart of the rekeyable lock cylinder.

FIG. **6** is a longitudinal sectional view illustrating the state of inserting the first matched key into the rekeyable lock cylinder according to the first preferred embodiment of the present invention.

FIG. **7** is a longitudinal sectional view illustrating the state of turning the first matched key 45-degrees clockwise according to the first preferred embodiment of the present invention.

FIG. **8** is a longitudinal sectional view illustrating the state of inserting a programming tool according to the first preferred embodiment of the present invention.

FIG. **9** is a longitudinal sectional view illustrating the state of turning the programming tool 90-degrees clockwise according to the first preferred embodiment of the present invention.

FIG. **10** is a longitudinal sectional view illustrating the state of pulling out the first matched key according to the first preferred embodiment of the present invention.

FIG. **11** is a longitudinal sectional view illustrating the state of inserting the second matched key into the rekeyable lock cylinder according to the first preferred embodiment of the present invention.

FIG. **12** is a longitudinal sectional view illustrating the state of turning the programming tool 90-degrees counter-clockwise according to the first preferred embodiment of the present invention.

FIG. **13** is a longitudinal sectional view illustrating the state of pulling out the programming tool according to the first preferred embodiment of the present invention.

FIG. **14** is a longitudinal sectional view illustrating that the rekeyable lock cylinder is in normal service state according to the first preferred embodiment of the present invention.

FIG. **15** is a perspective exploded view of a rekeyable lock cylinder according to the second preferred embodiment of the present invention.

FIG. **16** is a perspective assembly view of the rekeyable lock cylinder according to the second preferred embodiment of the present invention.

FIG. **17** is a partially broken away side view of a plug assembly according to the second preferred embodiment of the present invention.

FIG. **18** is a longitudinal sectional view illustrating the state of inserting the programming tool according to the second preferred embodiment of the present invention.

FIG. **19** is a longitudinal sectional view illustrating the state of turning the programming tool clockwise according to the second preferred embodiment of the present invention.

FIG. **20** is a perspective exploded view of a rekeyable lock cylinder according to the third preferred embodiment of the present invention.

FIG. **21** is a perspective assembly view of the rekeyable lock cylinder according to the third preferred embodiment of the present invention.

FIG. **22** is a partially broken away side view of a plug assembly according to the third preferred embodiment of the present invention.

FIG. **23** is a longitudinal sectional view illustrating the state of inserting the programming tool according to the third preferred embodiment of the present invention.

FIG. **24** is a longitudinal sectional view illustrating the state of turning the programming tool clockwise according to the third preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

With reference to FIGS. **1** and **2**, a rekeyable lock cylinder according to the first preferred embodiment of the present invention comprises a cylinder body **10**, a plug assembly **20** disposed within the cylinder body **10** and a plurality of upper pins **30**. The cylinder body **10** comprises a hollow cylinder portion **11** used for disposing the plug assembly **20**, an extending protrusion **12** formed at one side of the hollow cylinder portion **11** and a biasing element **13** disposed at the hollow cylinder portion **11**, however, the extending protrusion **12** can be omitted from the cylinder body **10** in another embodiment. In this embodiment, the hollow cylinder portion **11** has an inside wall **11***a*, an outside wall **11***b* and a recession **111** recessed from the inside wall **11***a*, wherein the recession **111** communicates with the inside wall **11***a* and the outside wall **11***b*. The extending protrusion **12** has a plurality of upper pin holes **121** in communication with the hollow cylinder portion **11**. With reference to FIGS. **1**, **2** and **4**, the biasing element **13** disposed at the recession **111** of the hollow cylinder portion **11** comprises a movable plate **131** and at least one resilient member **132** contacting against the movable plate **131**. In this embodiment, the movable plate **131** is transversely movable within the recession **111** and the biasing element **13** may further comprise an immovable plate **133** fixed at the recession **111**. The resilient member **132** is disposed between the movable plate **131** and the immovable plate **133** and two ends of the resilient member **132** contact against the movable plate **131** and the immovable plate **133** respectively.

With reference to FIGS. **1** and **3**, the plug assembly **20** comprises a plug body **21**, a plurality of assembled pins **22** and a position block **23**. The plug body **21** has a longitudinal axis **21***a*, a transverse axis **21***b* vertical to the longitudinal axis **21***a*, a front portion **211**, a rear portion **212**, a keyhole **213** and a first through hole **214** penetrating the front portion **211**. The rear portion **212** has a plurality of pin holes **215** used for disposing the assembled pins **22** and a trench **216** in communication with the pin holes **215**. The trench **216** has a trench wall **216***a* facing the first through hole **214** and a tool-fixing hole **216***b* recessed from the trench wall **216***a*, and the tool-fixing hole **216***b* is desirable to correspond to the first through hole **214**. Besides, the first through hole **214** communicates with the trench **216**. With reference again to FIGS. **1**, **3** and **4**, the assembled pins **22** are movably disposed in the pin holes **215** of the plug body **21**. In this embodiment, the assembled pins **22** are height-adjustable pins and each of them comprises a first rack component **221**, a second rack component **222** selectively engaging with the first rack component **221** and an elastic component **223** disposed between the first and second rack components **221**, **222**. Each of the first rack components **221** has a rib **221***a* and a rack portion **221***b* formed at the rib **221***a* and each of the ribs **221***a* has an accommodating slot **221***c*. With reference again to FIGS. **1**, **3** and **4**, the position block **23** disposed at the trench **216** of the rear portion **212** of the plug body **21** has a first side **23***a* facing the first through hole **214**, a second side **23***b* opposite to the first side **23***a*, an outside wall **23***c*, a plurality of pin runners **231** used for disposing the first rack components **221**, a second through hole **232** corresponding to the first through hole **214** and a tool-contacting surface **23***d* located within the second through hole **232**. The second through hole **232** communicates with the first and second sides **23***a*, **23***b*, and also with the pin runners **231**. Besides, there is a hole wall **233** within the second through hole **232**, the hole wall **233** has a first wall **233***a* facing the first rack components **221** and a second wall **233***b* opposite to the first wall **233***a*. The tool-contacting surface **23***d* is desirable to be the first wall **233***a*. With reference again to FIGS. **1**, **3** and **4**, the upper pins **30** are movably disposed at least one upper pin hole **121** of the extending protrusion **12** of the cylinder body **10** and at least one pin hole **215** of the rear portion **212** of the plug body **21**. Each of the upper pins **30** contacts against each of the first rack components **221**.

With reference again to FIGS. **1**, **3** and **4**, when the rekeyable lock cylinder of the present invention is rekeyed, it needs to use a programming tool **40** for disengaging and reengaging the first and second rack components **221**, **222**. The programming tool **40** will penetrate the first through hole **214** of the plug body **21** and the second through hole **232** of the position block **23** when applied to rekey and has a contacting portion **41** which can push against the position block **23** and make each of the first rack components **221** move along the transverse axis **21***b*-direction of the plug body **21** to release engagement with each of the second rack components **222**. The contacting portion **41** has an arc side wall **41***a* which may contact against the tool-contacting surface **23***d* of the position block **23**.

FIG. **5** illustrates operating method of the rekeyable lock cylinder comprising "providing a rekeyable lock cylinder" step **500**, "inserting a first matched key into keyhole of plug body" step **510**, "turning first matched key to drive plug body and position block rotating" step **520**, "inserting a program-

ming tool into first through hole of plug body and second through hole of position block" step **530**, "turning programming tool to push against position block and make first rack components move along transverse axis-direction of plug body to release engagement with second rack components" step **540**, "pulling out first matched key" step **550**, "inserting a second matched key into keyhole of plug body" step **560**, "turning programming tool to make first rack components reengage with second rack components" step **570**, "pulling out programming tool" step **580** and "turning second matched key to make lock cylinder restore normal service state" step **590**. First, with reference to step **500** of FIG. **5**, FIGS. **2** and **4**, the rekeyable lock cylinder is formed by assembling the cylinder body **10**, the plug assembly **20** and the upper pins **30** during "providing a rekeyable lock cylinder" step **500**, wherein the first rack components **221** are in engagement with the second rack components **222** within the rekeyable lock cylinder. Next, with reference to step **510** of FIG. **5** and FIG. **6**, a first matched key **60** is inserted into the keyhole **213** of the plug body **21** during "inserting a first matched key into keyhole of plug body" step **510**, wherein the first matched key **60** will push against the assembled pins **22** to move upward to rotating interface, the accommodating slots **221***c* of the ribs **221***a* of the first rack components **221** are in alignment. Next, with reference to step **520** of FIG. **5** and FIG. **6**, the first matched key **60** is turned to drive the plug body **21** and the position block **23** rotating to a predetermined angular position during "turning first matched key to drive plug body and position block rotating" step **520**, wherein the first matched key **60** is turned 45-degrees clockwise, the position block **23** corresponds to the recession **111** of the hollow cylinder portion **11** and the biasing element **13** and also contacts against the movable plate **131** of the biasing element **13**. Next, with reference to step **530** of FIG. **5** and FIG. **8**, a programming tool **40** is inserted into the first through hole **214** of the plug body **21** and the second through hole **232** of the position block **23** during "inserting a programming tool into first through hole of plug body and second through hole of position block" step **530**, wherein the contacting portion **41** of the programming tool **40** corresponds to each of the accommodating slots **221***c* of the ribs **221***a* of the first rack components **221**. Next, with reference to step **540** of FIG. **5** and FIG. **9**, the programming tool **40** is turned to make the contacting portion **41** push against the tool-contacting surface **23***d* of the position block **23** and drive the position block **23** to move along the transverse axis **21***b*-direction of the plug body **21** during "turning programming tool to push against position block and make first rack components move along transverse axis-direction of plug body to release engagement with second rack components" step **540**, wherein the programming tool **40** is turned 90-degrees clockwise, the arc side wall **41***a* of the contacting portion **41** contacts and pushes against the tool-contacting surface **23***d*, the movable plate **131** of the biasing element **13** is pushed by the position block **23** to move toward the immovable plate **133** and compress the resilient member **132**, and when the position block **23** moves, it will drive each of the first rack components **221** to move along the transverse axis **21***b*-direction of the plug body **21**, thereby releasing engagement with each of the second rack components **222**. Next, with reference to step **550** of FIG. **5** and FIG. **10**, the first matched key **60** is pulled out during "pulling out first matched key" step **550**, wherein the second rack components **222** of the assembled pins **22** are pushed by the elastic components **223** to fall down to lowermost position. Next, with reference to step **560** of FIG. **5** and FIG. **11**, a second matched key **70** is inserted into the keyhole **213** of the plug body **21** during "inserting a second matched key into keyhole of plug body" step **560**, wherein the second rack components **222** of the assembled pins **22** readjust height according to bitting of the second matched key **70** with different height. Next, with reference to step **570** of FIG. **5** and FIG. **12**, the programming tool **40** is turned to make the first rack components **221** reengage with the second rack components **222** during "turning programming tool to make first rack components reengage with second rack components" step **570**, wherein the programming tool **40** is turned 90-degrees counterclockwise, the arc side wall **41***a* of the contacting portion **41** moves away from the tool-contacting surface **23***d*, the position block **23** is pushed by the resilient member **132** of the biasing element **13** to restore and drive each of the first rack components **221** to reengage with each of the second rack components **222**. Next, with reference to step **580** of FIG. **5** and FIG. **13**, the programming tool **40** is pulled out during "pulling out programming tool" step **580**. Finally, with reference to step **590** of FIG. **5** and FIG. **14**, the second matched key **70** is turned to make the rekeyable lock cylinder restore normal service state during "turning second matched key to make lock cylinder restore normal service state" step **590**.

The programming tool **40** according to the present invention can contact against the tool-contacting surface **23***d* of the position block **23** during turning process to push against the position block **23** and drive the first rack components **221** releasing engagement with the second rack components. On the contrary, if the programming tool **40** cannot contact against the tool-contacting surface **23***d* during turning process, the position block **23** cannot be moved and cannot rekey, therefore, the present invent has efficiency of enhancing burglarproof of the rekeyable lock cylinder.

With reference to FIGS. **15**, **16** and **17**, which illustrates a rekeyable lock cylinder according to the second preferred embodiment of the present invention, the structural characteristic in this embodiment is basically the same as that in the first preferred embodiment, but the only difference is that the position block **23** further has at least one tool-aligning hole **234** and a limiting slot **235** in communication with the second through hole **232** as well as the contacting portion **41** of the programming tool **40** further has at least one limiting block **411** in order to surely enhance burglarproof of lock cylinder in this embodiment. The tool-aligning hole **234** of the position block **23** communicates with the outside wall **23***c* and the tool-contacting surface **23***d*. The programming tool **40** having the limiting block **411** can be regarded as a dedicated key. Moreover, with reference to FIG. **18**, operating method of this embodiment is also basically the same as that in the first preferred embodiment, but the only difference is that the programming tool **40** can be turned after it is inserted into the first through hole **214** of the plug body **21** and the second through hole **232** of the position block **23** only if the limiting block **411** of the contacting portion **41** corresponds to the tool-aligning hole **234** of the position block **23**. The limiting block **411** of the contacting portion **41** will be limited by the limiting slot **235** if it does not correspond to the tool-aligning hole **234** of the position block **23**, which makes the programming tool **40** be unable to rotate thereby enhancing burglarproof of lock cylinder. Besides, with reference to FIG. **19**, the programming tool **40** is turned to make the contacting portion **41** push against the tool-contacting surface **23***d* of the position block **23** and drive the position block **23** to move along the transverse axis **21***b*-direction of the plug body **21**, which makes the first rack components **221** release engagement with the second rack components **222**. In this embodiment, the tool-aligning hole **234** of the position block **23** provides a space needed for rotation of the limiting block **411** of the programming tool **40** to prevent the limiting block **411** from

being caught by the limiting slot **235** resulting in that the programming tool **40** is unable to rotate.

With reference to FIGS. **20**, **21** and **22**, which illustrates a rekeyable lock cylinder according to the third preferred embodiment of the present invention, the structural characteristic in this embodiment is basically the same as that in the second preferred embodiment, but the only difference is that the contacting portion **41** of the programming tool **40** further has at least one pushing block **412** which is able to contact against the tool-contacting surface **23***d* of the position block **23** in this embodiment. The limiting block **411** of the contacting portion **41** has a first height H**1**, the pushing block **412** has a second height H**2**, and preferably the first height H**1** of the limiting block **411** is higher than the second height H**2** of the pushing block **412**. Besides, the programming tool **40** having the limiting block **411** and the pushing block **412** also can be regarded as a dedicated key. In addition, with reference to FIG. **23**, operating method of this embodiment is also basically the same as that in the second preferred embodiment, the programming tool **40** can be turned after it is inserted into the first through hole **214** of the plug body **21** and the second through hole **232** of the position block **23** only if the limiting block **411** of the contacting portion **41** corresponds to the tool-aligning hole **234** of the position block **23**. With reference to FIG. **24**, the only difference of operating method between the second and third embodiments is that when turning the programming tool **40**, the pushing block **412** of the contacting portion **41** pushes against the tool-contacting surface **23***d* of the position block **23** in this embodiment to drive the position block **23** moving along the transverse axis **21***b*-direction of the plug body **21**, which makes the first rack components **221** release engagement with the second rack components **222**.

While this invention has been particularly illustrated and described in detail with respect to the preferred embodiments thereof, it will be clearly understood by those skilled in the art that is not limited to the specific features shown and described and various modified and changed in form and details may be made without departing from the spirit and scope of this invention.

What is claimed is:

1. A rekeyable lock cylinder comprising:

a cylinder body; and

a plug assembly disposed within the cylinder body comprising:

a plug body having a longitudinal axis, a transverse axis vertical to the longitudinal axis, a keyhole and a first through hole;

a plurality of assembled pins movably disposed in the plug body, each of the assembled pins comprising a first rack component and a second rack component selectively engaging with the first rack component; and

a position block disposed at the plug body, the position block having a plurality of pin runners used for disposing the first rack components, a second through hole corresponding to the first through hole and a tool-contacting surface located within the second through hole, wherein the position block can move along the transverse axis-direction of the plug body to make each of the first rack components release engagement with each of the second rack components,

wherein the position block has an outside wall and at least one tool-aligning hole, the tool-aligning hole communicates with the outside wall and the tool-contacting surface.

2. The rekeyable lock cylinder in accordance with claim **1**, wherein the plug body has a front portion and a rear portion, the rear portion has a plurality of pin holes used for disposing the assembled pins and a trench in communication with the pin holes, the position block is disposed at the trench, the first through hole penetrates the front portion and communicates with the trench.

3. The rekeyable lock cylinder in accordance with claim **1**, wherein the cylinder body comprises a hollow cylinder portion used for disposing the plug assembly and a biasing element, the hollow cylinder portion has an inside wall and a recession recessed from the inside wall, the biasing element is disposed at the recession.

4. The rekeyable lock cylinder in accordance with claim **3**, wherein the biasing element comprises a movable plate capable of being pushed by the position block and at least one resilient member contacting against the movable plate.

5. The rekeyable lock cylinder in accordance with claim **1**, further comprising a plurality of upper pins, each of the upper pins contacting against each of the first rack components.

6. A rekeyable lock cylinder comprising:

a cylinder body;

a plug assembly disposed within the cylinder body comprising:

a plug body having a longitudinal axis, a transverse axis vertical to the longitudinal axis, a keyhole and a first through hole;

a plurality of assembled pins movably disposed in the plug body, each of the assembled pins comprising a first rack component and a second rack component selectively engaging with the first rack component; and

a position block disposed at the plug body, the position block having a plurality of pin runners used for disposing the first rack components, a second through hole corresponding to the first through hole and a tool-contacting surface located within the second through hole; and

a programming tool disposed penetrating the first and second through holes and having a contacting portion, wherein the contacting portion can push against the tool-contacting surface of the position block and make each of the first rack components move along the transverse axis-direction of the plug body to release engagement with each of the second rack components,

wherein the contacting portion of the programming tool has at least one limiting block, the position block has at least one tool-aligning hole, the limiting block of the contacting portion corresponds to the tool-aligning hole of the position block.

7. The rekeyable lock cylinder in accordance with claim **6**, wherein the contacting portion of the programming tool further has at least one pushing block, the pushing block contacts against the tool-contacting surface.

8. The rekeyable lock cylinder in accordance with claim **7**, wherein the limiting block of the contacting portion has a first height, the pushing block has a second height, the first height is higher than the second height.

9. The rekeyable lock cylinder in accordance with claim **6**, wherein the position block has an outside wall, the tool-aligning hole communicates with the outside wall and the tool-contacting surface.

10. The rekeyable lock cylinder in accordance with claim **6**, wherein the cylinder body comprises a hollow cylinder portion used for disposing the plug assembly and a biasing

element, the hollow cylinder portion has an inside wall and a recession recessed from the inside wall, the biasing element is disposed at the recession.

11. The rekeyable lock cylinder in accordance with claim **10**, wherein the biasing element comprises a movable plate capable of being pushed by the position block and at least one resilient member contacting against the movable plate.

12. The rekeyable lock cylinder in accordance with claim **6**, further comprising a plurality of upper pins, each of the upper pins contacting against each of the first rack components.

13. Operating method of a rekeyable lock cylinder comprising the steps of:

providing a rekeyable lock cylinder, wherein the rekeyable lock cylinder at least comprises a plug body, a position block disposed at the plug body and a plurality of assembled pins, the plug body has a transverse axis, a keyhole and a first through hole, each of the assembled pins at least comprises a first rack component and a second rack component in engagement with the first rack component, the position block has a second through hole corresponding to the first through hole and a tool-contacting surface located within the second through hole;

inserting a first matched key into the keyhole of the plug body;

turning the first matched key;

inserting a programming tool into the first through hole of the plug body and the second through hole of the position block;

turning the programming tool to push against the tool-contacting surface of the position block and make each of the first rack components move along the transverse axis-direction of the plug body to release engagement with each of the second rack components;

pulling out the first matched key;

inserting a second matched key into the keyhole of the plug body; and

turning the programming tool to make each of the first rack components reengage with each of the second rack components,

wherein the programming tool has a contacting portion, the contacting portion has at least one limiting block, the position block has at least one tool-aligning hole, the limiting block of the contacting portion corresponds to the tool-aligning hole of the position block.

14. The operating method of the rekeyable lock cylinder in accordance with claim **13**, further comprising a step of pulling out the programming tool, the rekeyable lock cylinder further comprising a biasing element to make the position block restore after pulling out the programming tool.

15. The operating method of the rekeyable lock cylinder in accordance with claim **14**, wherein the biasing element comprises a movable plate capable of being pushed by the position block and at least one resilient member contacting against the movable plate.

16. The operating method of the rekeyable lock cylinder in accordance with claim **13**, wherein there is a hole wall within the second through hole of the position block, the hole wall has a first wall facing the first rack components and a second wall opposite to the first wall, the tool-contacting surface is the first wall.

17. The operating method of the rekeyable lock cylinder in accordance with claim **13**, wherein the rekeyable lock cylinder further comprises a plurality of upper pins, each of the upper pins contacts against each of the first rack components.

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